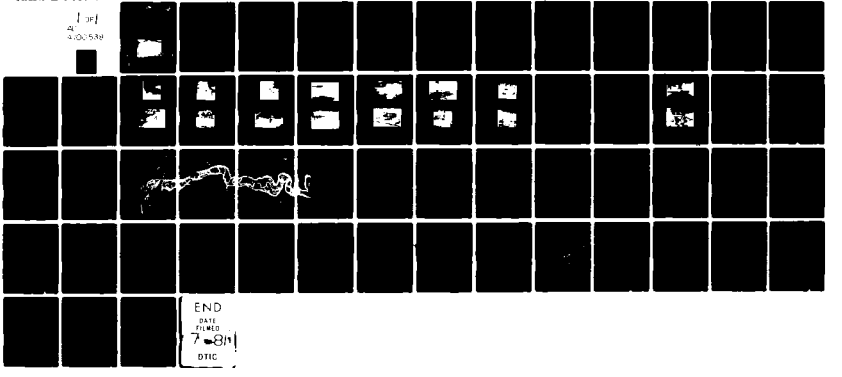
AD-A100 538 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 8/8
FLOOD PLAIN INFORMATION, FLOOD HAZARD REPORT OF 4-7 JULY 1969 F--ETC(U)
MAY 70

UNCLASSIFIED NL



END
DATE FILMED
7-81
DTIC

LEVEL II

12

FLOOD PLAIN INFORMATION

FLOOD HAZARD REPORT

OF

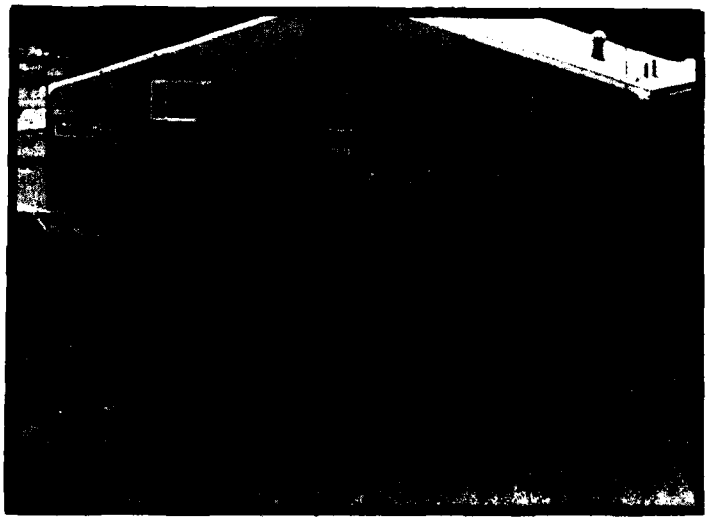
4-7 JULY 1969 FLOOD

VERMILION RIVER

SKELLENGER CREEK

BONNEY CREEK

OHIO



PREPARED BY

U. S. ARMY ENGINEER DISTRICT, BUFFALO

MAY 1970

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO. AD-A100538

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
Flood Plain Information, Flood Hazard Report of 4-7 July 1969 Flood, Vermillion River, Skellenger Creek, Honey Creek, Ohio.

5. TYPE OF REPORT & PERIOD COVERED
Final

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
E

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS
U.S. ARMY Engineer, Buffalo
1776 Niagara Street
Buffalo, New York 14207

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, New York 14207

12. REPORT DATE
May 1970

13. NUMBER OF PAGES
34

14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*

15. SECURITY CLASS. *(of this report)*

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Distribution Unlimited

Accession For	
NTIS GRA&I	X
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	

Released

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

UNANNOUNCED

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Floods
Flooding
Vermillion River

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This flood hazard report has been prepared for the use of State and local government agencies, planners, developers, individuals and others that may need this type of informaiton. The flooded area map and the water surface profile of the July 1969 flood are known in this report and are based on information gathered during and immediate after the flood.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

4

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

INTRODUCTION

This flood hazard report has been prepared for the use of State and local government agencies, planners, developers, individuals and others that may have a need for this type of information. This report will be most beneficial to those who are involved in authorizing, planning or constructing any type of development in the flood plain.

The flooded area map and the water surface profile of the July 1969 Flood are shown in this report and are based on the information gathered during and immediately after the flood. The flooded area map shows those areas where flood hazards must be considered. The profiles indicate the amount of fill required or to what elevation flood proofing must be provided to prevent damage. You can locate your home or building site on the map. Use the river mile of your site, as shown on the map, and find the flood elevation on the profile for the same river mile.

Future development within the flood area should not be allowed indiscriminately. The Flood Plain Management program does not recommend that future development be eliminated from the flood plain, only controlled. Of primary importance, a floodway width should be established within which no restrictive construction or fills are allowed. This insures that there is room to pass future floods. Less frequently flooded areas can be used for those developments which are not affected by flooding or which have been constructed so

as to prevent damage or have been placed above flood levels. An illustrative example of recommended flood plain uses is shown in exhibit I.

It is the responsibility of all levels of government in the State to protect unsuspecting buyers from the anguish of having their personal property damaged or destroyed by floods. Planners at all levels must not ignore the possibility of future floods of equal or greater extent than those which have already occurred. Developments must be planned to stay out of flood areas, be compatible with flooding, be constructed above flood levels, or be provided with adequate flood protection. For those already in the flood plain there are pamphlets available which describe methods which can be used to provide flood proofing of structures. Quantities of these pamphlets have been distributed to the municipal offices covered by this report.

The description of floods and the photographs in this report show that damages will continue to increase if unwise development increases. The photographs especially show the results of unwise development.

As damages that occurred from the July 1969 Flood were readily available they have been included in this report to remind all concerned of the damages that can occur if flood hazards are not given proper consideration when planning developments. Over a long period of time a flood of the magnitude of the July 1969 Flood should not occur frequently, perhaps once in 100 years, but there is no way to

know when another flood of similar size will occur. Valuable developments should be constructed above the July 1969 Flood levels or protected from a recurrence of that magnitude of flooding in order to be relatively safe from future damages.

The areas affected by the July 1969 Flood will probably be studied to determine whether flood control projects are justified. Flood control projects are usually justified only in populated areas where damages are high so that the remaining areas must have controlling regulations to help prevent damages to future development. Even areas where improvement projects are constructed cannot be protected from all possible floods so that controlling regulations are still needed to guide new construction.

Some flood plain management can be carried out on a voluntary basis if everyone concerned will use the information in this report to guide their planning and construction. The program is much more effective and uniform and will be tailored to the needs of the community if it is based on regulations drawn up and adopted by the local governments. The staff of the Buffalo District is available to provide technical assistance in developing ordinances and regulations.

In the State of Ohio, the power to adopt and enforce zoning regulations is delegated to political subdivisions. The enabling statutes are sections 303.02, 519.02 and 713.07 of the revised code and they provide for regulation of land use by counties, cities, and

towns. If flood plain development is allowed to continue without any controls the next major flood will cause even more damage and destruction. Individual property owners must make it known to their local governments that they desire and will support well planned land use regulations.

The Buffalo District, Corps of Engineers, is available for assistance to anyone interested in reducing possible future flood damages. The Corps of Engineers does not have, nor want, the authority to regulate development in flood plain lands, but, through our Flood Plain Management Services Program we have provided the flood outlines and elevations on which local communities can base regulations. This office will turnish, upon request, examples of flood plain regulations adopted in communities throughout the United States.

A general information map on the 4-7 July 1969 storm is shown on plate 1.

VERMILION RIVER, OHIO

There is one water stage recorder operated by the U.S. Geological Survey on the Vermilion River. It is located on the right bank, 40 feet downstream of the North Ridge Road bridge in Lorain County, 3.5 miles southwest of the city of Vermilion, Erie County, and 4.5 miles upstream from the mouth. The gaging station was established in March 1950 and records the stages resulting from the runoff from 262 square miles of watershed upstream of that point. The total drainage area at the mouth is 272 square miles so that the gage site measures almost the total river flow. Shown on plate 2 are the stage and discharge hydrographs for the July 1969 flood occurrence. The data for the peak of the stage-hydrograph were established by indirect survey methods by the U.S.G.S. because the gage chart was damaged during the flood.

Based on precipitation gages in the Vermilion River watershed it is estimated that about 6.7 inches of rain fell within a 24-hour period with an average intensity of 0.28 inch per hour. From the rainfall intensity-duration-frequency curve for the Vermilion River Basin shown on plate 3, the average intensity of 0.28 inch per hour for 24 hours has an occurrence less frequent than once in 100 years.

There is shown on plate 4 the area inundated by the July 1969 flood. A water surface profile, constructed from high water marks obtained by Buffalo District personnel shortly after the July 1969 flood, is

shown on plates 5 through 7. Comparative profiles of the March 1913, January 1959, and March 1963 floods are also shown where data were available.

The greatest historical flood along the Vermilion River had occurred in March 1913. This flood is regarded as a historical flood since it occurred before formal record keeping of flood stages began with the establishment of the U. S. Geological Survey gage in March 1950. Other floods have occurred between 1913 and 1950 but no factual data are available for them. The 1913 flood was great enough so that some highwater marks and newspaper accounts are still available.

Floods on the Vermilion River are often accompanied by ice jams resulting in flood stages higher than they would be from river discharge alone. This was apparent during the January 1959 and January 1968 highwater occurrences. The January 1959 flood was considered to be the greatest flood since records were kept.

Highwater marks show that the July 1969 flood was about 5 feet higher than the January 1959 flood in Vermilion and about 3.3 feet higher at the gaging station. The 1969 stage was greater than the 1913 stage at Ohio State Route 2. The January 1959 flood had a discharge of 20,500 cfs. Prior to the July 1969 flood, it had a recurrence interval of once in 40 years. Based on the new discharge-frequency curve which included the July 1969 discharge, the discharge of 20,500 cfs

now has a recurrence interval of once in 20 years. The July 1969 flood had a discharge estimated at 40,800 cfs and a frequency of once in 100 years. The stage-discharge and discharge-frequency curves at the gage are shown on plates 8 and 9, respectively.

Two stage-frequency curves were developed for the Vermilion River. The first one was for the gage location and is shown on plate 10. The 17.14-foot stage for the July 1969 flood has a frequency of once in 100 years. A stage-frequency developed for the downstream side of the Penn Central Company bridge is shown on plate 11. The effects of ice jams and backwater effect from Lake Erie are reflected in the lower part of this curve due to the proximity of the bridge to the lake. It is estimated that the recurrence interval for the 1969 stage at this location has a frequency of about once in 50 years.

A condensation of available information on the March 1913, January 1959 and the July 1969 floods is given in the following paragraphs. Comparative data for these floods and several other highwater occurrences are given in table 1 following the flood description.

a. March 1913 - This flood was reported at that time to be the most destructive in the history of Vermilion. The river height was estimated to be 10 feet above normal and the lowlands east of the river were flooded to Linwood Park Heights. The magnitude of the discharge and resulting stage were such that flood water overtopped the spit of land east of the channel piers and cut an additional

channel into the lake. Toledo, South and Ohio Streets were under water and some residents of the city had to be rescued by boats. A number of small fishing boats and pleasure craft were carried into Lake Erie and much damage was caused to fishing nets and equipment. On the east side of the river the Schenn and Black fish houses were torn from their foundations and partially demolished. The water-works pumping station was flooded to a depth of 8 inches. As the lagoon area on the east bank downstream of Liberty Avenue was natural marshland during the 1913 flood, little damage resulted. No estimate of total damages for the 1913 flood was found in any of the newspaper accounts.

b. January 1959 - The January 1959 flood resulted from the melting of the snow cover, rain and subsequent ice jams near the mouth of the river. Rainfall of 2 to 3 inches fell on still frozen ground and the river reached the highest level since the 1913 flood. During the 3-day period from 21-23 January the Coast Guard and local groups evacuated 450 people. Some, who returned to their homes after the first rise on 21 January had receded, were marooned by a higher peak on 22 January and were evacuated a second time. Water was up to 4 feet deep on the floors of the 45 cottages of the Vermilion River Park area and up to 3 feet deep on the floors of the 26 cottages of the Olympic Outing Club. For the first time since the homes were constructed, residents of the Vermilion Lagoons downstream of

Liberty Avenue were evacuated from approximately 60 residences along Park Drive, Willow Lane and Portage Avenue. Water was about 2 feet deep in the streets and damage was primarily limited to flooded crawl spaces and basements. Ice floes up to 16 inches thick were lodged on the streets and lawns after the flood waters receded.

c. July 1969 - The July 1969 flood resulted from a tornado type storm, accompanied by severe thundershowers, which deposited record rainfall in many areas of Ohio. The river reached its highest level, dating back to the early 1900's. The Vermilion Lagoons area, located on the right bank and extending from the mouth upstream to Liberty Avenue, suffered the greatest damage. The storm began at about 7:00 p.m. on Friday (4 July) and at 1:00 a.m. on Sunday the G. S. gage at North Ridge Road recorded a peak of 17.1 feet, the maximum stage of record, and about 15 feet above normal for that time. The river crested in the lagoons area at 3:30 a.m. same day. It has been estimated that water rose as high as 7 feet in many of the 150 homes in the flooded area. None of the riverside homes and summer cottages in the area escaped flood damage, and about 100 homes suffered extensive property damage. Evacuation of the area began about 5:00 p.m. on Saturday. Approximately 50 persons who elected to stay behind to salvage personal belongings had to be rescued by Coast Guard helicopters on Sunday morning because the swift current in the river precluded the use of watercraft. A total of about

500 persons were evacuated by the Coast Guard and local groups. No loss of life was reported. It was estimated that about 200 pleasure crafts were either lost or destroyed. The river was described by many residents as a graveyard of boats, houses, trailers, docks and cars.

Early Sunday morning, residents found themselves beset with still another problem. Instead of too much water, it was too little. The pumps at the Main Street water works shorted out when they became submerged by flood waters. Before water was restored, at about 2:00 p.m. on Sunday, serious health problems existed and the State Board of Health ordered boiling of all drinking water.

Red Cross units opened three emergency shelters in the City, while the Salvation Army furnished hot food for flood victims and workers alike. Liberty Avenue (U.S. Route 6 and Ohio Route 2) was ordered closed to traffic by Governor Rhodes.

The peak flood flows in the river breached the U. S. West Pier (breakwater) at the landward end of Vermilion Harbor. This break in the breakwater exposed a threat to homes due to lack of protection from a west or northwest wind and waves. The Buffalo District began repair operations on 9 July and completed operations on 18 August at a cost of approximately $115,000.

Table 1. - Peak stages and discharges at the Vermilion River gage site

Date	Stage (feet)	Discharge c.f.s.	Discharge c.f.s. per sq. mi.
6 July 1969	17.14	40,800	155.7
6 March 1963	15.8	*	
21 Jan. 1959	13.8	20,500	78.2
30 Jan. 1968	13.1	14,200	54.2
26 Jan. 1952	11.5	9,820	37.5
12 May 1956	11.47	9,820	37.5
3 Dec. 1950	10.8	8,320	31.8

Note: Zero of gage is 594.91 feet (U.S.C. &G.S. Datum)

*Discharge not determined due to extensive ice jam downstream of gage

Figures 1 through 14 show flooding conditions during and after the July 1969 highwater occurrence.

The total estimated damages for the July 1969 flood for the reach from Lake Erie to Mill Hollow are listed in table 2. Also listed for comparison are the damages for the January 1959 and January 1968 floods brought up to July 1969 price levels.

Table 2. - Estimated damages for the July 1969 flood

Flood	Estimated damages				
	Residential	Commercial	Public and Other	Boats, Autos and Trailers	Total
	$	$	$	$	$
July 1969	1,600,000	830,000	600,000	670,000	3,700,000*
January 1959	90,000	190,000 (1)	-	320,000	600,000
January 1968	120,000	185,000	45,000	-	350,000

(1) Includes damage to public and other

Note: No details are given for the March 1913 flood because of the lack of data concerning the extent of flooding and the great change in development since that time. It is estimated that a recurrence of that flood level would result in damages of $2,000,000.

*Does not include repair to U. S. West Pier of $115,000, and repairs to roads and bridges washed out during the storm

Figure 1 - Looking northerly from shore at 400 foot washed out section of the westerly breakwater.

Figure 2 - Looking easterly along lakeshore at wreckage strewn about at the mouth of the river.

VERMILION RIVER, OHIO

Photos taken 7 July 1969

Figure 3 - Typical damage in lagoon area.

Figure 4 - Typical damage in lagoon area.

VERMILION RIVER, OHIO

Photos taken 7 July 1969

Figure 5 - Typical damage in lagoon area.

Figure 6 - Typical damage in lagoon area.

VERMILION RIVER, OHIO

Photos taken 7-8 July 1969

Figure 7 - Looking at flood approximately at peak. Note roof of McGarvey's Restaurant at right side of photo.

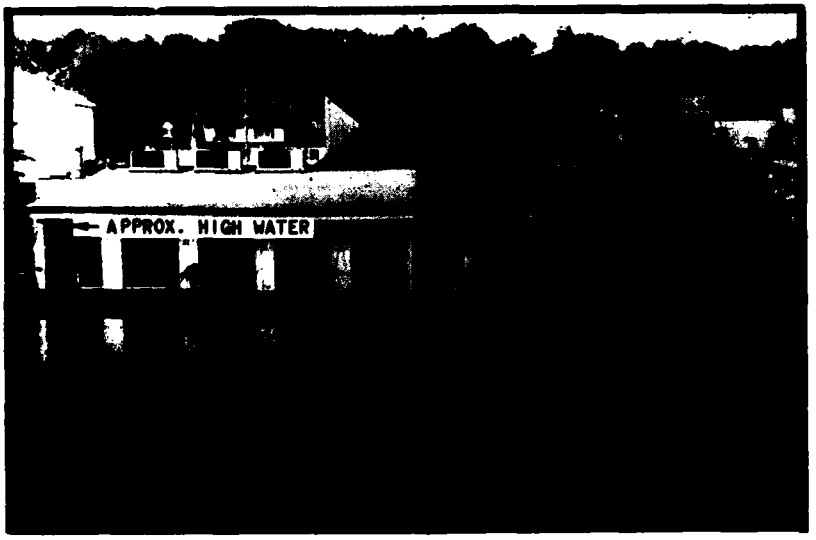


Figure 8 - Looking at McGarvey's Restaurant after flood.

VERMILION RIVER, OHIO

Photos taken 6&7 July 1969

Figure 9 - Looking at Valley Harbor Marina. Water was approximately even with top of showroom windows at the peak.

Figure 10 - Looking at typical damage in Olympic Outing Club area. Approximately 1.7 miles upstream from the mouth.

VERMILION RIVER, OHIO

Photos taken 6-7 July 1969

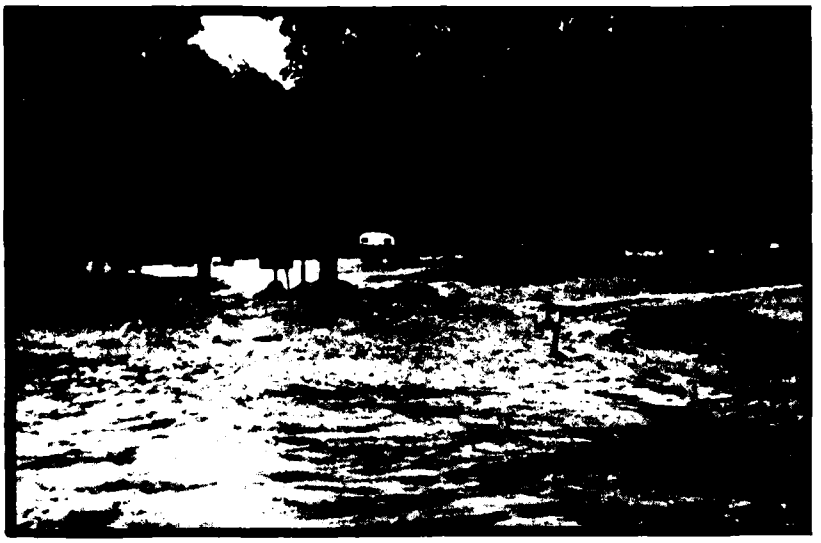


Figure 11 - Looking at Mill Hollow Park. Water was considerably higher at the peak.

Figure 12 - Aerial view looking westerly at Garfield Road bridge.

VERMILION RIVER, OHIO

Photos taken 6 July 1969

Figure 13 - Looking east at Garfield Road washout.

Figure 14 - Looking southerly at State Route 60 bridge washout. View is south of State Route 113.

VERMILION RIVER, OHIO

Photos taken 7 July 1969

BONNEY AND SKELLENGER CREEKS AT NEW LONDON, OHIO

The hardest hit areas in the community of approximately 2,400 people were those adjacent to and near Bonney and Skellenger Creeks, both tributaries to the East Branch of the Vermilion River. Skellenger Creek was the stream that caused the majority of the damage to the village. As in the 1913 storm, the culvert under the Penn Central Company bridge became clogged with debris, became a dam, and the village became a temporary reservoir for Skellenger Creek. Unofficially, 11 inches of rainfall was reported for the area.

The new wing of the New London Hospital was flooded and without electric power for 24 hours when stand-by generators were inundated. New X-ray equipment was damaged and all food supplies in the freezers were lost.

Residents along Prospect Street had waist-high water in their homes and had to be evacuated by boat. The hardest hit area along Prospect Street was between South Main Street and the entrance to the park. The pumps at the sewage treatment plant were out of service Saturday and part of Sunday. Heavy damage was reported to the following industrial firms: C. E. Ward Company, Ballonoff Manufacturing Company, Bigelow Tile Company and Firelands Electric Cooperative Incorporated.

Shown on plate 12 is the area inundated by the July 1969 flood. Water surface profiles constructed from highwater marks obtained by Buffalo District personnel shortly after the July flood on both Bonney and Skellenger Creeks are shown on plates 13 and 14, respectively.

Shown in figure 15 is the Firelands Electric Corporation Inc. Company. The water surface was 4.9 feet above the first floor elevation. Figure 16 is a view of a demolished spillway of a private reservoir just upstream of Chenango Road.

The total estimated damages for the flood are listed in table 3.

Table 3. - Estimated damages for the July 1969 flood

Creek	Estimated damages*			
	Residential	Commercial	Public and other	Total
Bonney and Skellenger	$1,250,000	$300,000	$150,000	$1,700,000

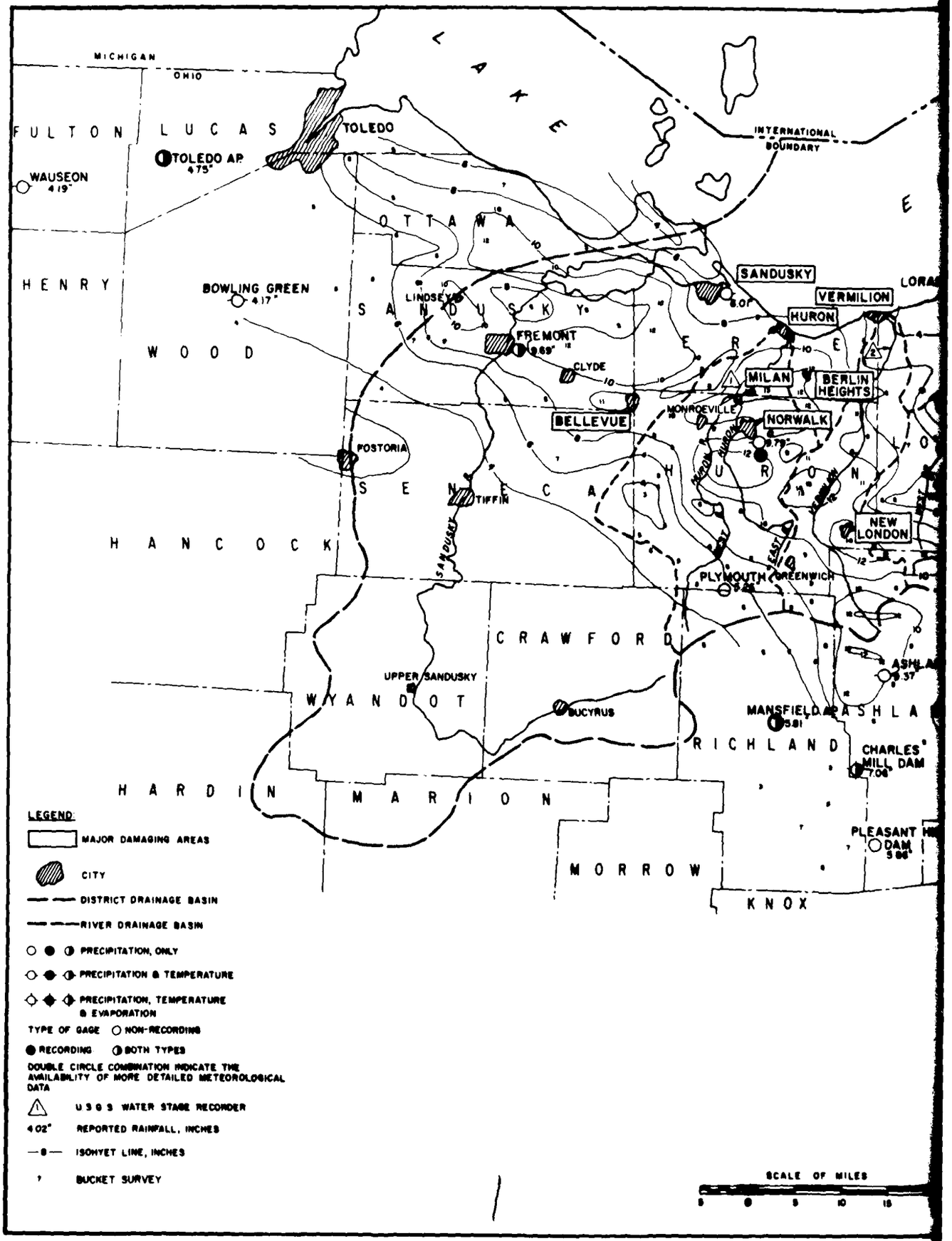
*Does not include damages sustained by the Penn Central Company railroad.

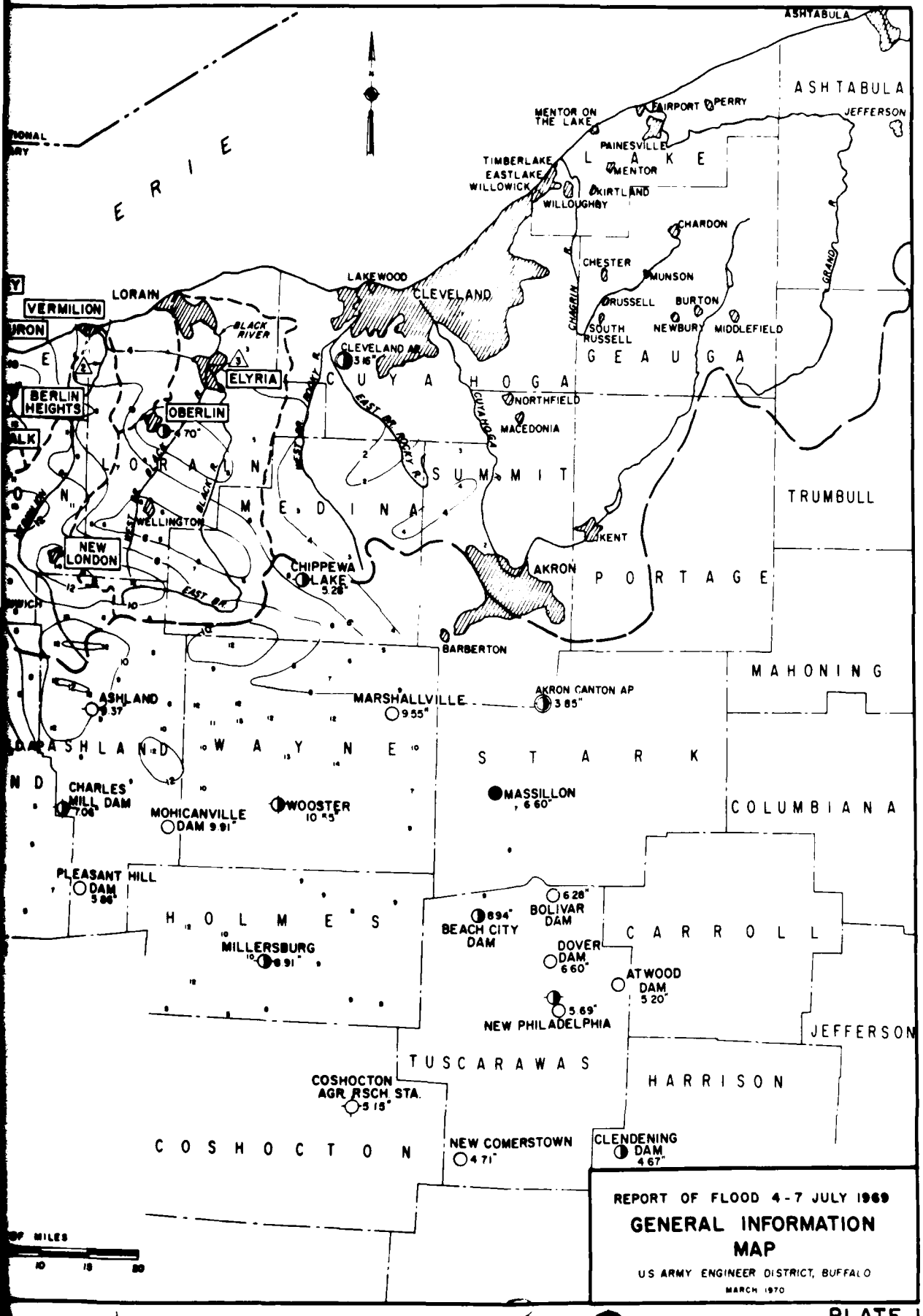
Figure 15 - Skellenger Creek: Water was 4.9 feet above the threshold at the front door. Just upstream of the Penn Central Co. Railroad.

Figure 16 - Bonney Creek: Spillway washout on a private reservoir upstream of Chenango Road in New London.

NEW LONDON, OHIO

Photos taken 8 July 1969


MICHIGAN
OHIO
FULTON
LUCAS
TOLEDO
TOLEDO AP
4.75"
WAUSEON
4.19"
INTERNATIONAL BOUNDARY
OTTAWA
HENRY
BOWLING GREEN
4.17"
LINDSEY
SANDUSKY
VERMILION
HURON
WOOD
FREMONT
9.89"
CLYDE
MILAN
BERLIN HEIGHTS
MONROEVILLE
BELLEVUE
NORWALK
9.79"
POSTORIA
SENECA
TIFFIN
HURON
NEW LONDON
HANCOCK
SANDUSKY
PLYMOUTH
GREENWICH
CRAWFORD
UPPER SANDUSKY
WYANDOT
BUCYRUS
MANSFIELD AP
5.81
ASHLAND
5.37
RICHLAND
CHARLES MILL DAM
7.06
HARDIN
MARION
PLEASANT HILL DAM
5.86
MORROW
KNOX
LEGEND
MAJOR DAMAGING AREAS
CITY
DISTRICT DRAINAGE BASIN
RIVER DRAINAGE BASIN
PRECIPITATION, ONLY
PRECIPITATION & TEMPERATURE
PRECIPITATION, TEMPERATURE & EVAPORATION
TYPE OF GAGE
NON-RECORDING
RECORDING
BOTH TYPES
DOUBLE CIRCLE COMBINATION INDICATE THE AVAILABILITY OF MORE DETAILED METEOROLOGICAL DATA
U S G S WATER STAGE RECORDER
4.02"
REPORTED RAINFALL, INCHES
ISOHYET LINE, INCHES
BUCKET SURVEY
SCALE OF MILES
0
5
10
15



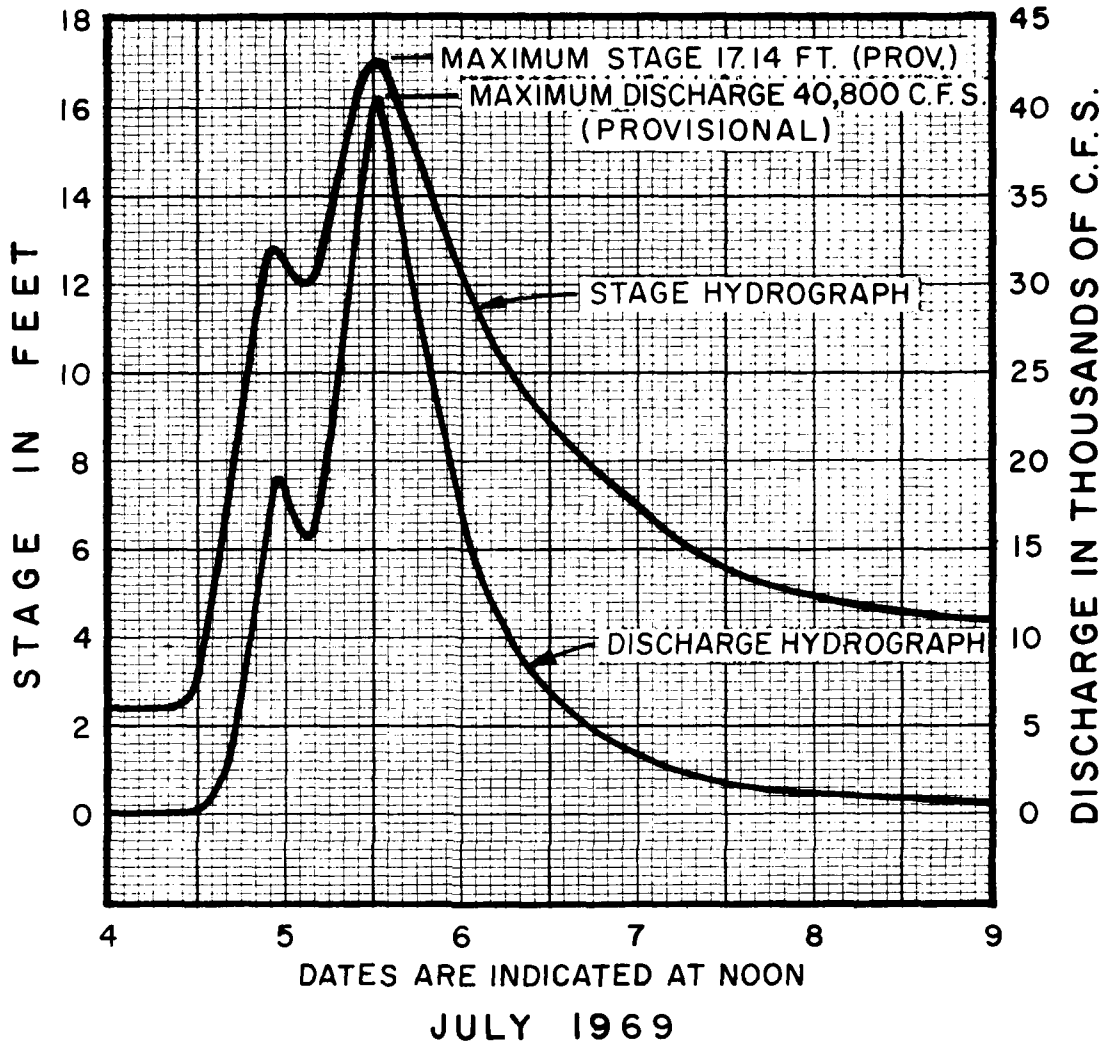
REPORT OF FLOOD 4-7 JULY 1969

GENERAL INFORMATION MAP

US ARMY ENGINEER DISTRICT, BUFFALO

MARCH 1970

PLATE 1



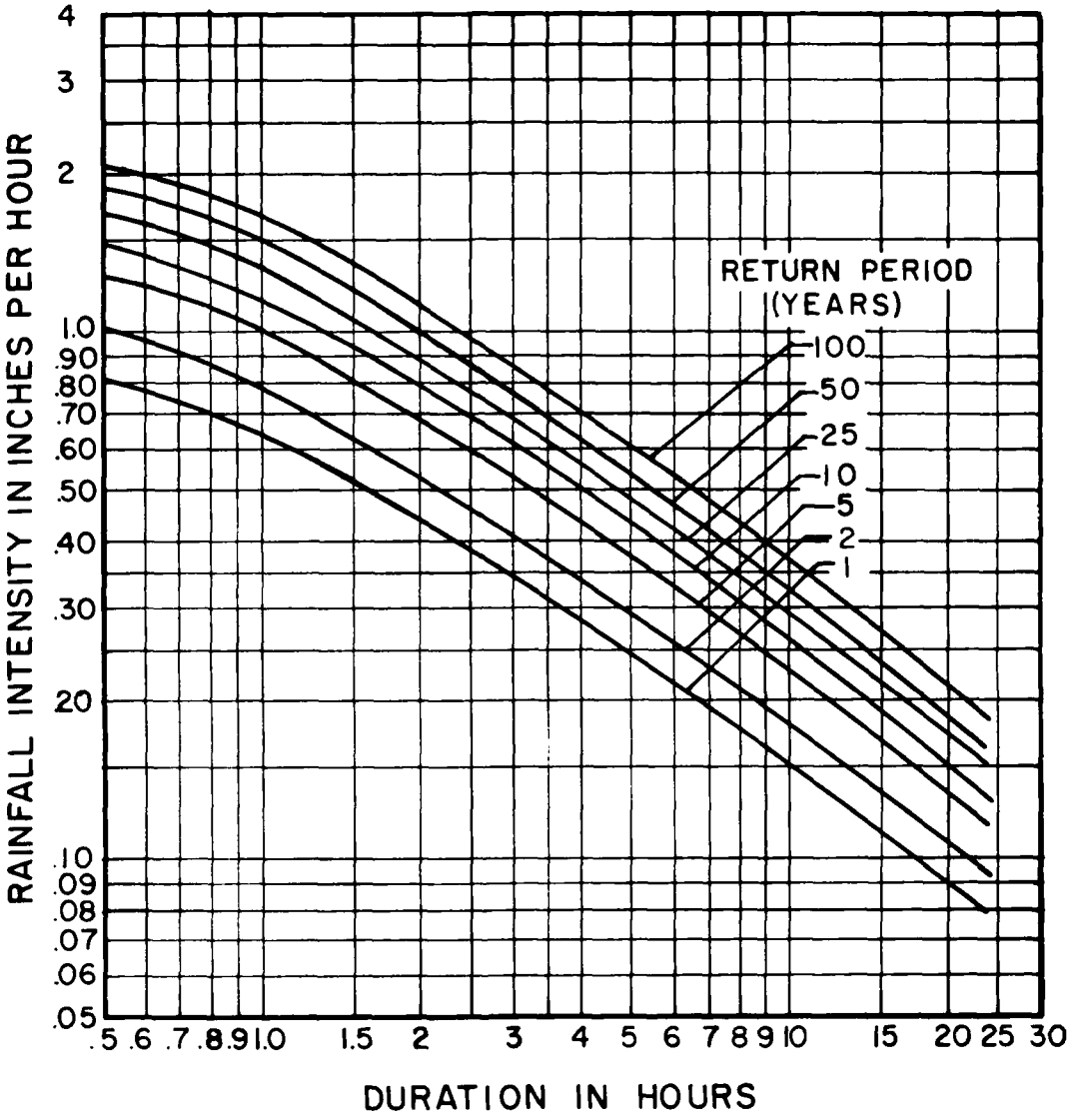
NOTES:

ZERO OF GAGE = 594.91 U.S.C.& G.S. DATUM

DRAINAGE AREA = 262 SQUARE MILES.

REPORT OF FLOOD 4-7 JULY 1969
VERMILION RIVER
STAGE & DISCHARGE HYDROGRAPHS
U.S.G.S. GAGE DOWNSTREAM OF NORTH RIDGE ROAD
U.S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970

PLATE 2



DERIVED FROM U.S. WEATHER BUREAU TECHNICAL PAPER NO. 40, "RAINFALL FREQUENCY ATLAS OF THE UNITED STATES"

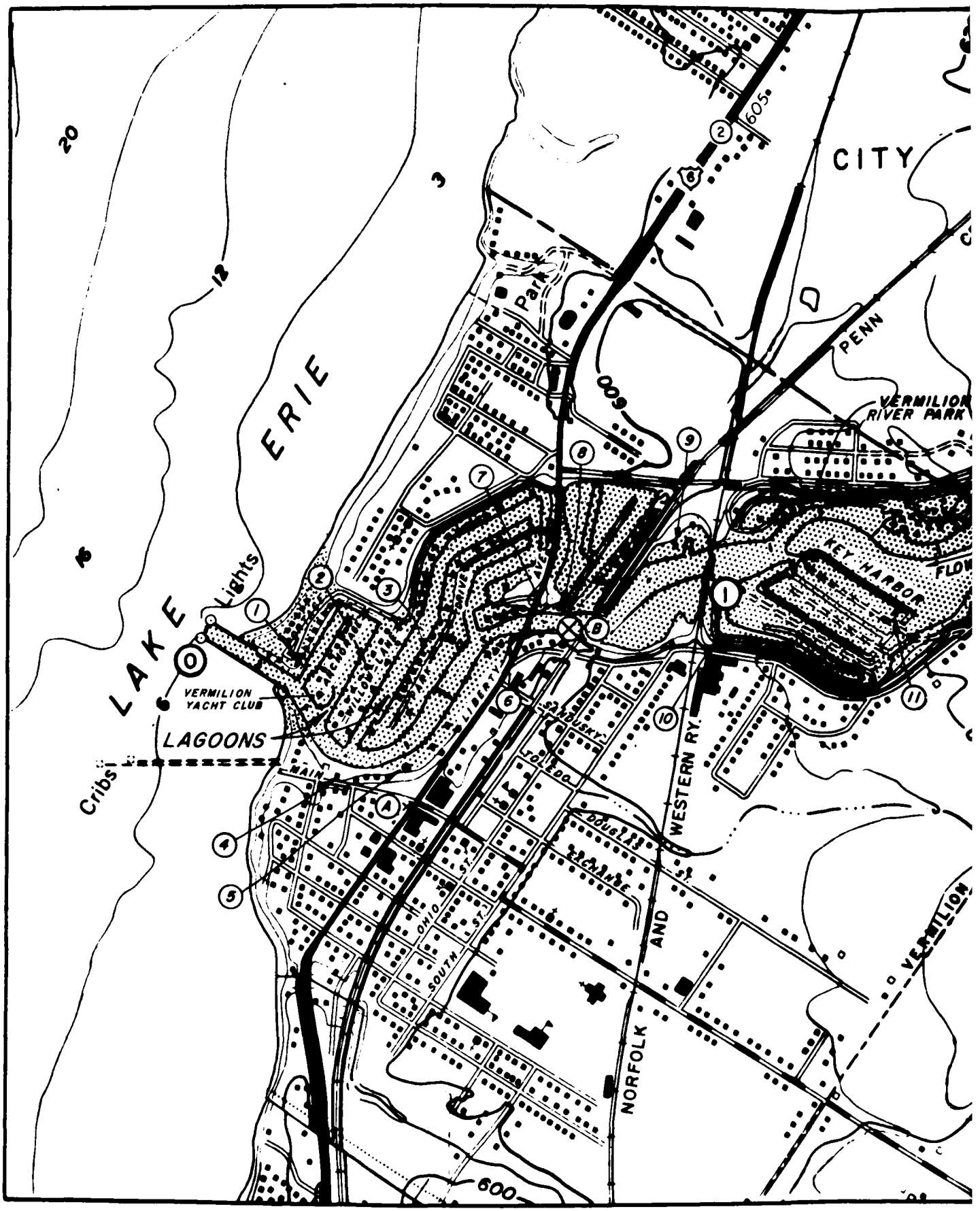
REPORT OF FLOOD 4-7 JULY 1969
VERMILION RIVER

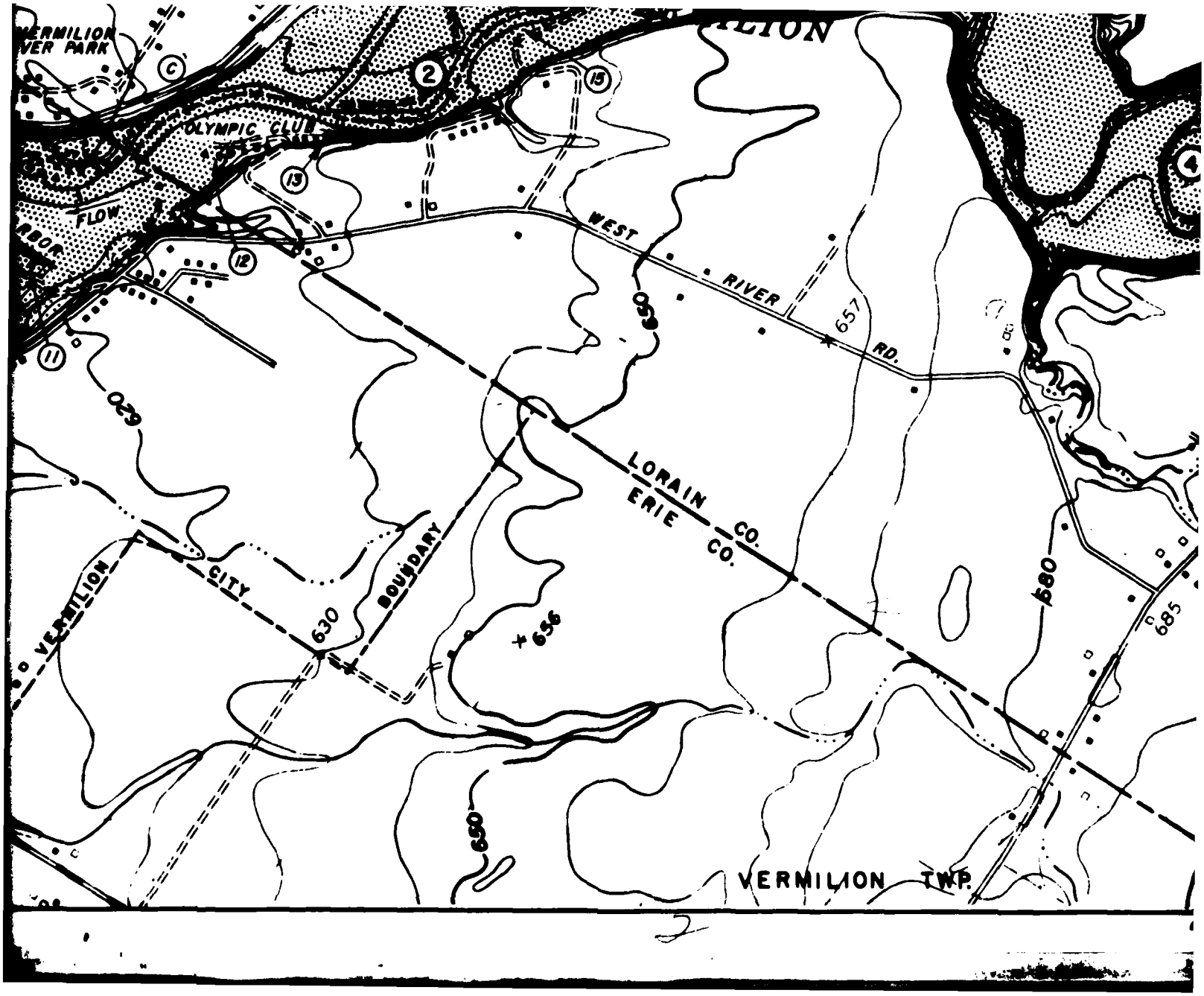
RAINFALL INTENSITY-DURATION FREQUENCY CURVES

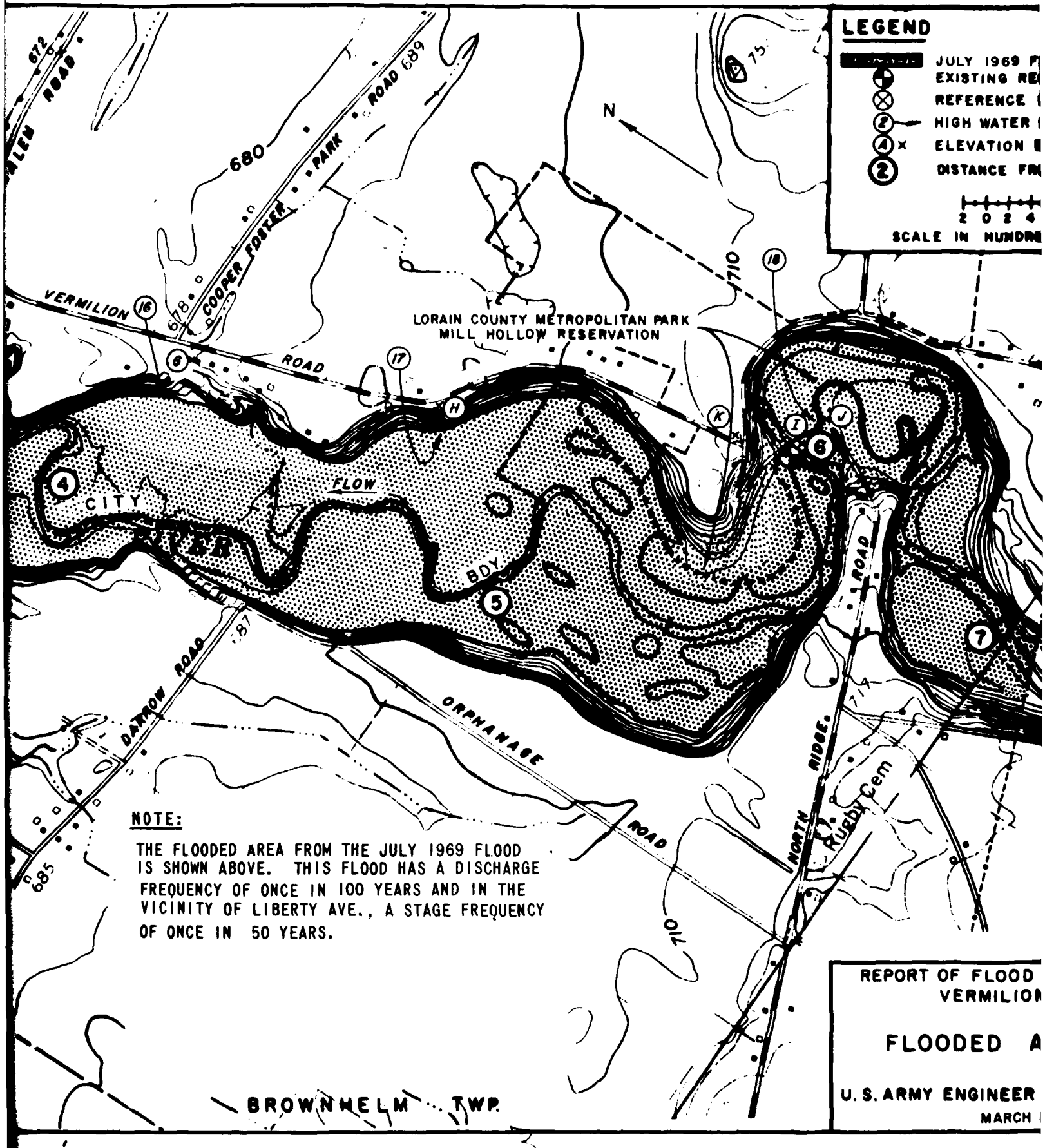
U.S. ARMY ENGINEER DISTRICT, BUFFALO

MARCH 1970

PLATE 3


LAKE ERIE
CITY
Park
PENN
VERMILION RIVER PARK
KEY HARBOR
FLOW
Lights
VERMILION YACHT CLUB
LAGOONS
Cribs
MAIN
YELLOW LAKE
LIBERTY
SANDUSKY
TOLEDO
DOUGLAS
EXCHANGE
OHIO
SOUTH
WESTERN RY.
AND
NORFOLK
VERMILION
605
600
20
12
3


VERMILION
VER PARK
OLYMPIC CLUB
FLOW
RIVER
WEST
RIVER
RD.
657
LORAIN CO.
ERIE CO.
CITY
BOUNDARY
VERMILION
630
656
650
680
685
VERMILION TWP.



NOTE:

THE FLOODED AREA FROM THE JULY 1969 FLOOD IS SHOWN ABOVE. THIS FLOOD HAS A DISCHARGE FREQUENCY OF ONCE IN 100 YEARS AND IN THE VICINITY OF LIBERTY AVE., A STAGE FREQUENCY OF ONCE IN 50 YEARS.

REPORT OF FLOOD
VERMILION

FLOODED A

U.S. ARMY ENGINEER
MARCH

969 FLOOD
6 RECORDING GAGE
NCE POINT
ATER MARK
TION BENCH MARK
CE FROM MOUTH IN MILES

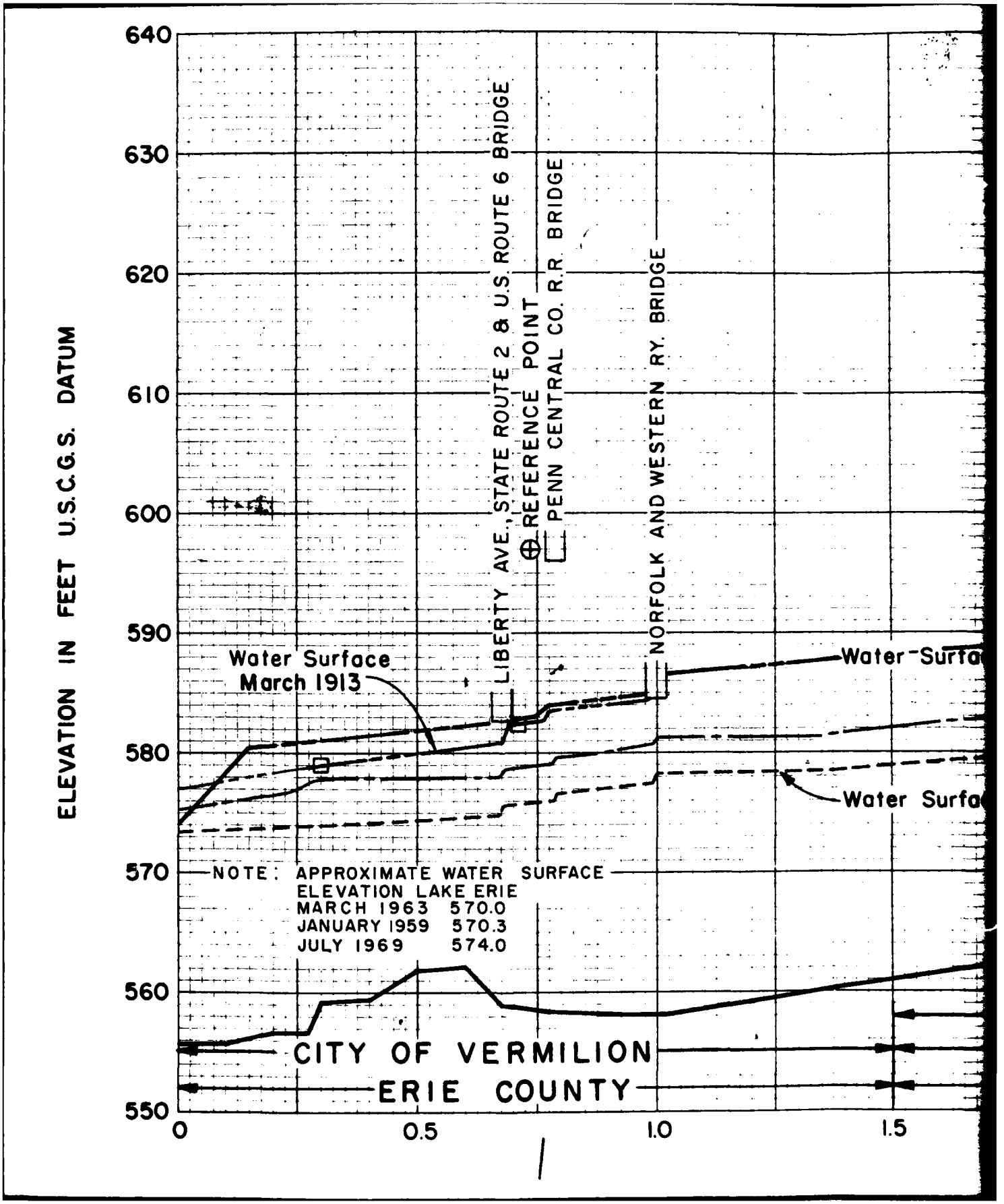
0 2 4 6 8
HUNDREDS OF FEET

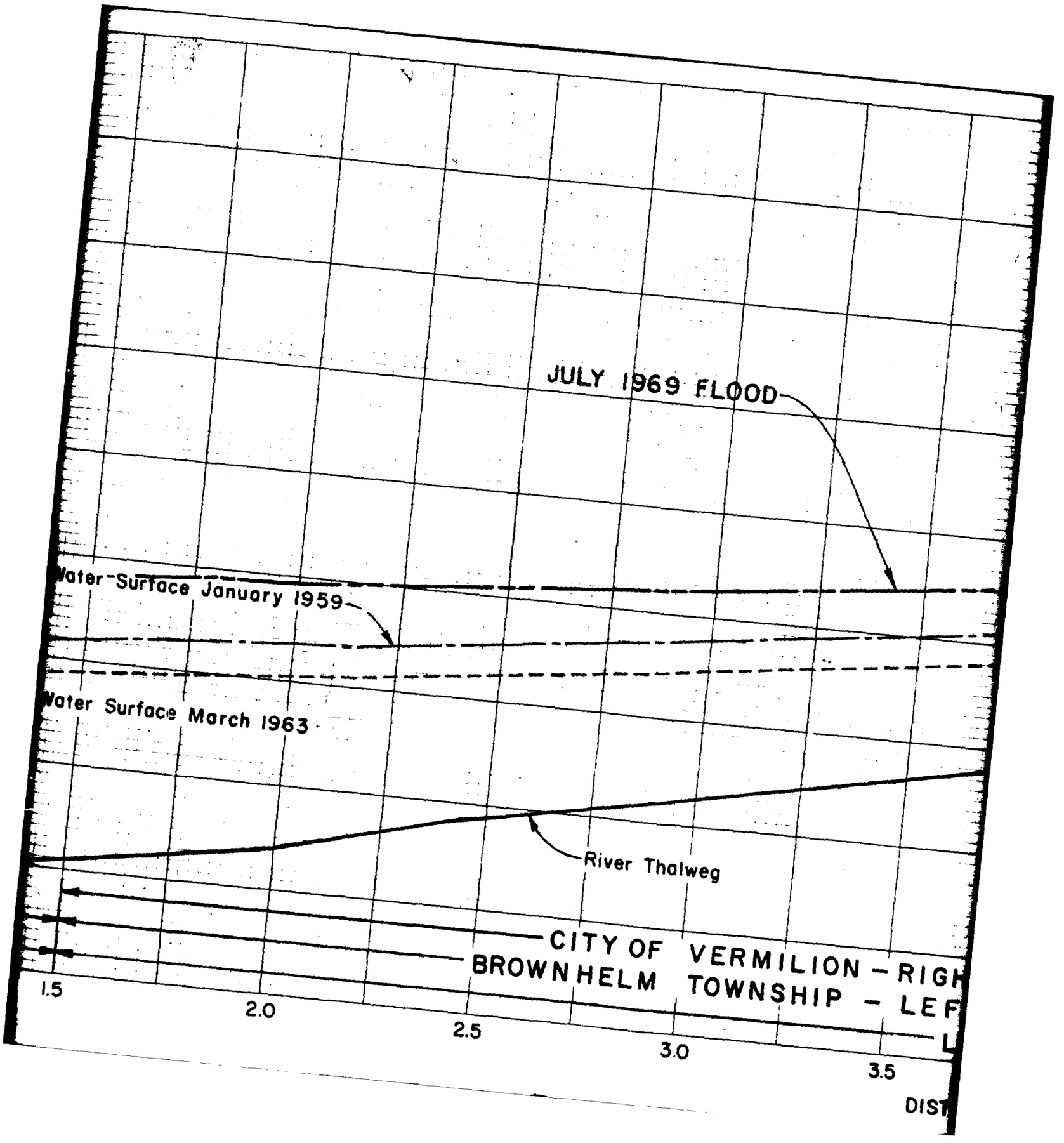
LOOD 4-7 JULY 1969
ILION RIVER

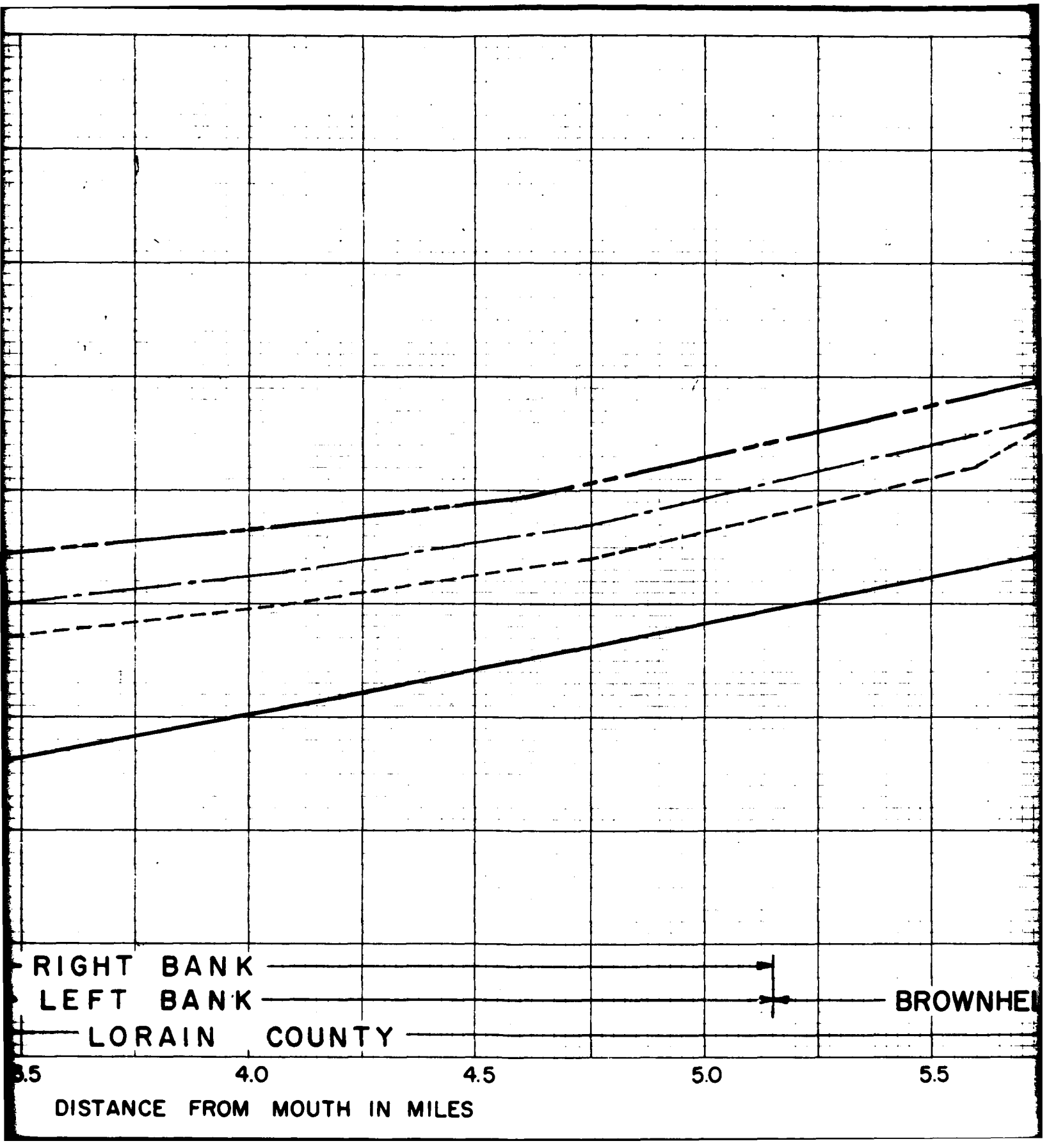
D AREA MAP

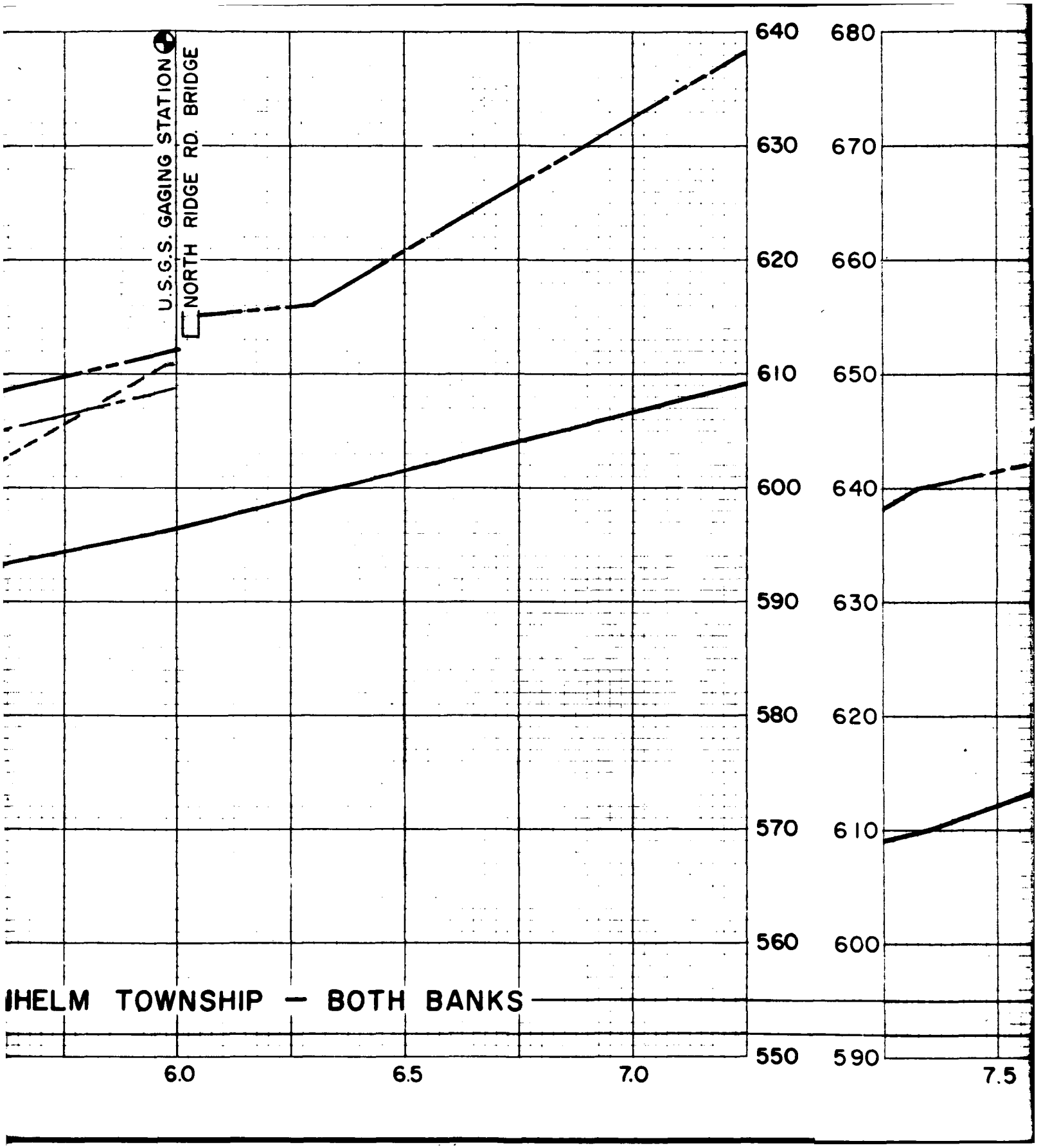
NEER DISTRICT, BUFFALO
ARCH 1970

PLATE 4

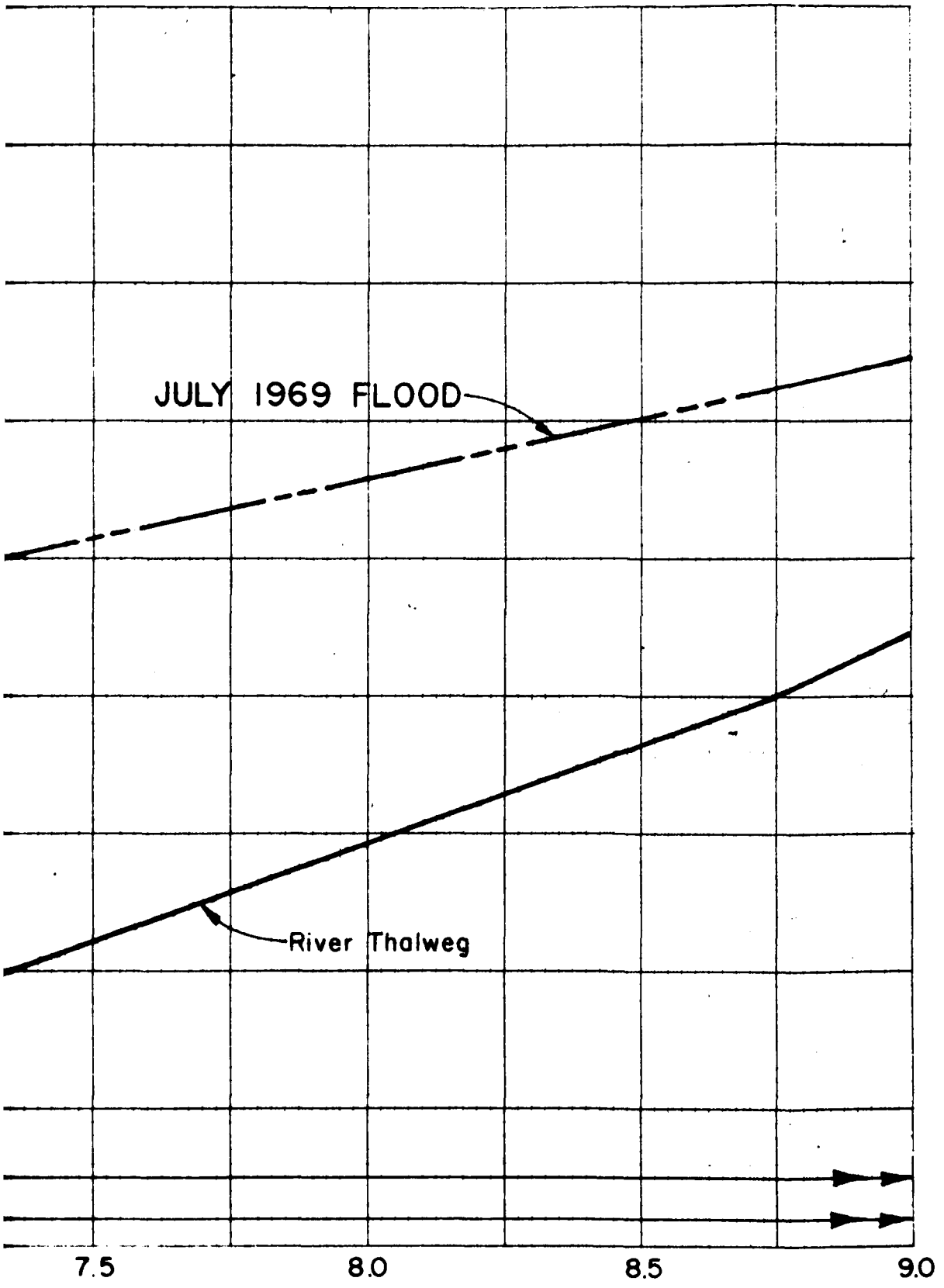

ELEVATION IN FEET U.S.C.G.S. DATUM
640
630
620
610
600
590
580
570
560
550
0
0.5
1.0
1.5
LIBERTY AVE., STATE ROUTE 2 & U.S. ROUTE 6 BRIDGE
REFERENCE POINT
PENN CENTRAL CO. R.R. BRIDGE
NORFOLK AND WESTERN RY. BRIDGE
Water Surface
March 1913
Water Surfa
Water Surfa
NOTE: APPROXIMATE WATER SURFACE
ELEVATION LAKE ERIE
MARCH 1963 570.0
JANUARY 1959 570.3
JULY 1969 574.0
CITY OF VERMILION
ERIE COUNTY


JULY 1969 FLOOD
Water Surface January 1959
Water Surface March 1963
River Thalweg
CITY OF VERMILION - RIGH
BROWNHELM TOWNSHIP - LEF
1.5
2.0
2.5
3.0
3.5
DIST


RIGHT BANK
LEFT BANK
LORAIN COUNTY
BROWNHEL
4.0
4.5
5.0
5.5
DISTANCE FROM MOUTH IN MILES



IHELM TOWNSHIP — BOTH BANKS



LEGE

⊕ REFERENCE

◒ EXISTING GA

BRIDGE - LOW

⊡ 1913 FLOOD E

REPORT C

WATER

U. S. ARMY

LEGEND

ENCE POINT

ING GAGE LOCATION

E - LOW STEEL ELEVATION

LOOD ELEVATION

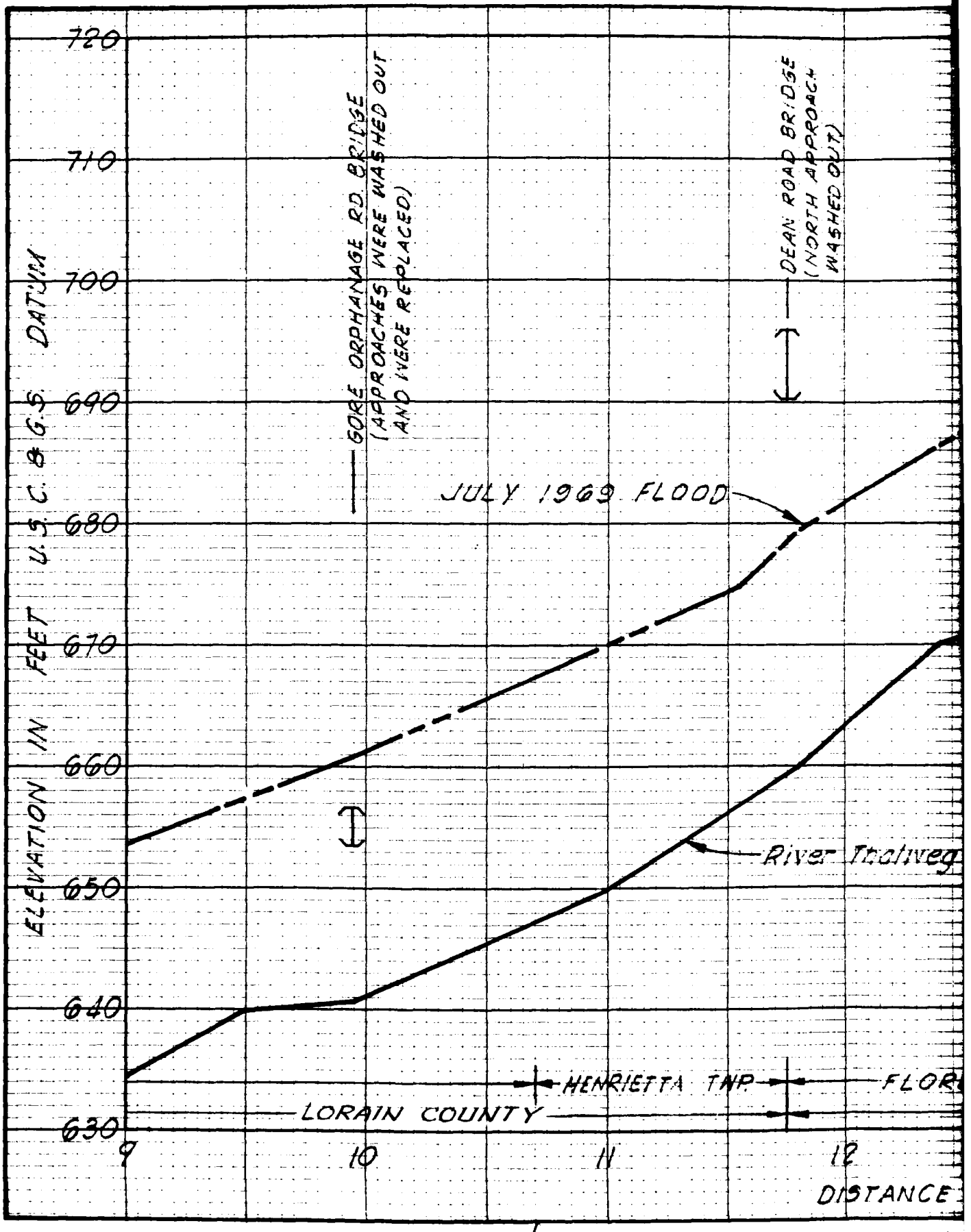
REPORT OF FLOOD 4-7 JULY 1969
VERMILION RIVER

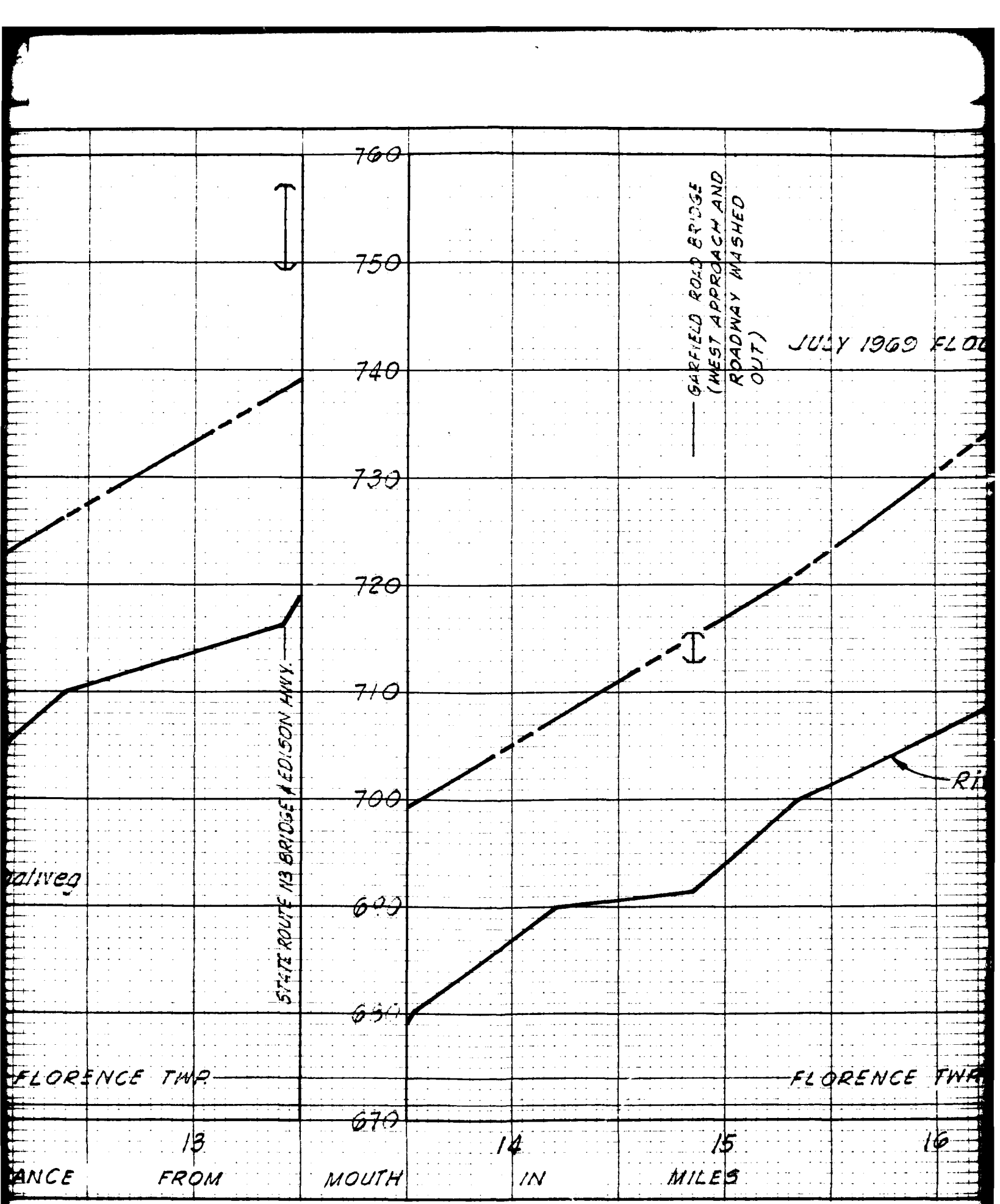
WATER SURFACE PROFILES

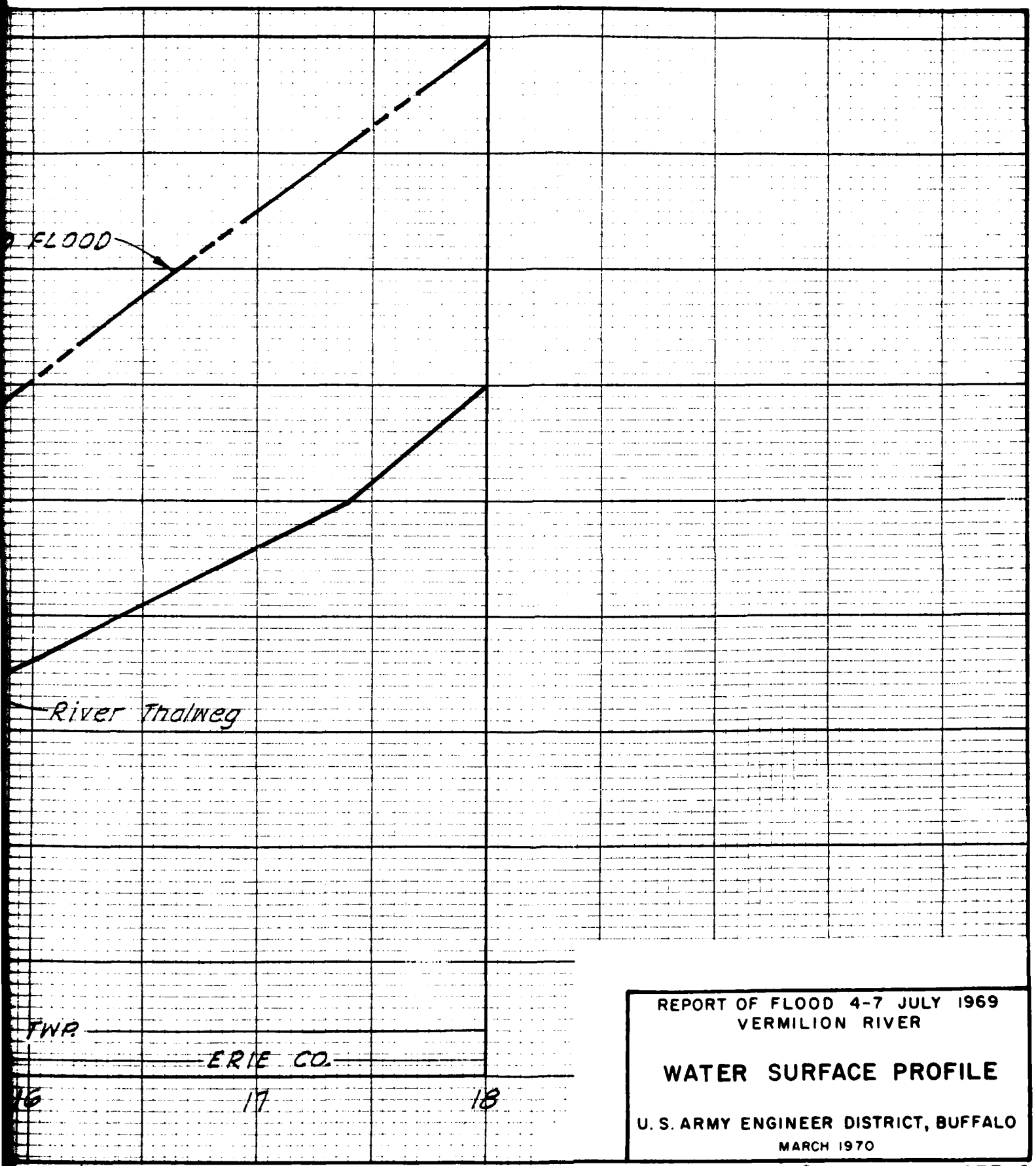
S. ARMY ENGINEER DISTRICT, BUFFALO

MARCH 1970

PLATE 5


720
710
700
690
680
670
660
650
640
630
ELEVATION IN FEET U.S.C. & G.S. DATUM
GORE ORPHANAGE RD. BRIDGE
(APPROACHES WERE WASHED OUT
AND WERE REPLACED)
DEAN ROAD BRIDGE
(NORTH APPROACH
WASHED OUT)
JULY 1969 FLOOD
River Thalweg
HENRIETTA TWP.
LORAIN COUNTY
9
10
11
12
DISTANCE


760
750
740
730
720
710
700
690
680
670
GARFIELD ROAD BRIDGE
(WEST APPROACH AND
ROADWAY WASHED
OUT)
JULY 1969 FLO
STATE ROUTE 113 BRIDGE & EDISON HWY.
FLORENCE TWP.
FLORENCE TWP.
13
14
15
16
ANCE
FROM
MOUTH
IN
MILES

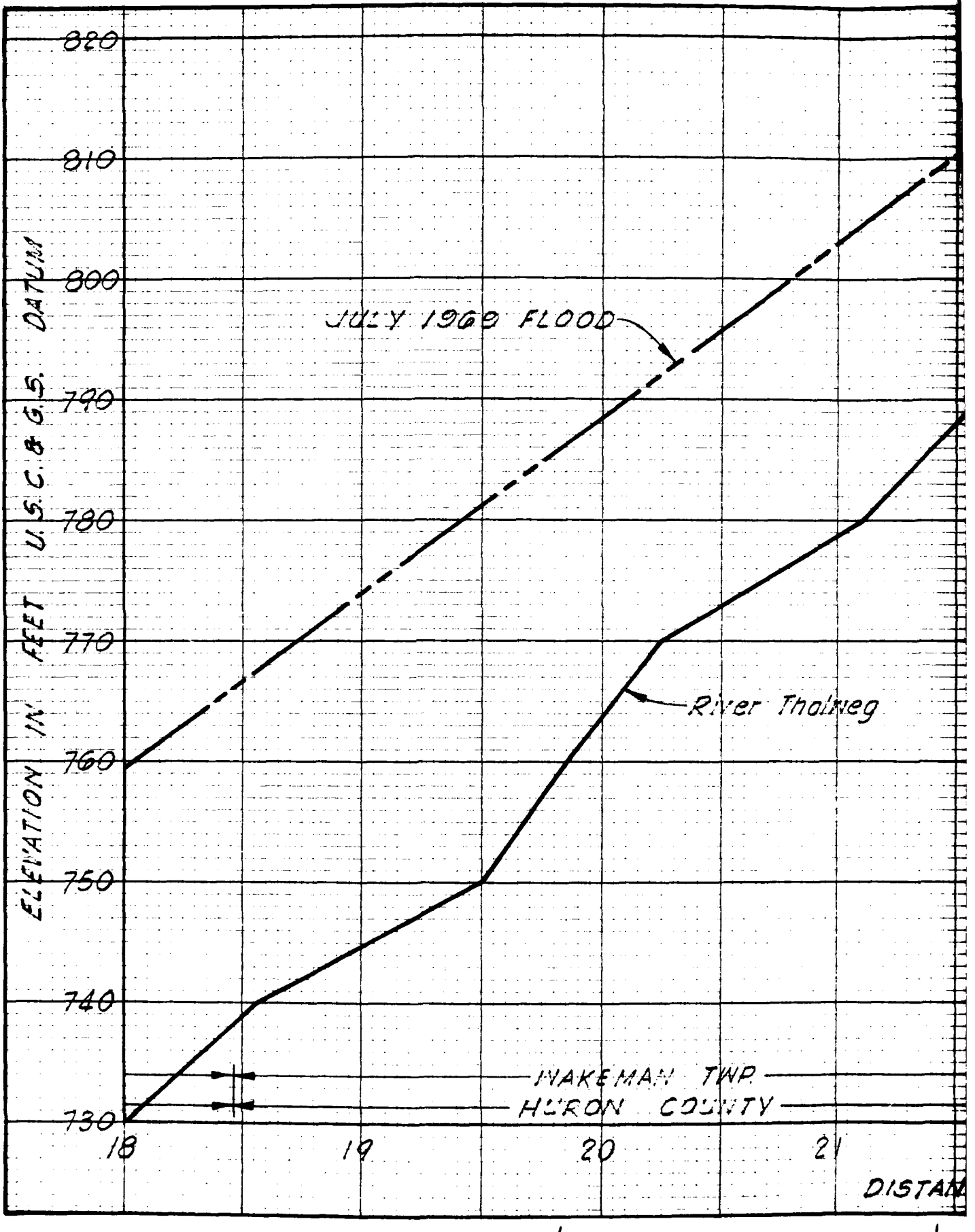


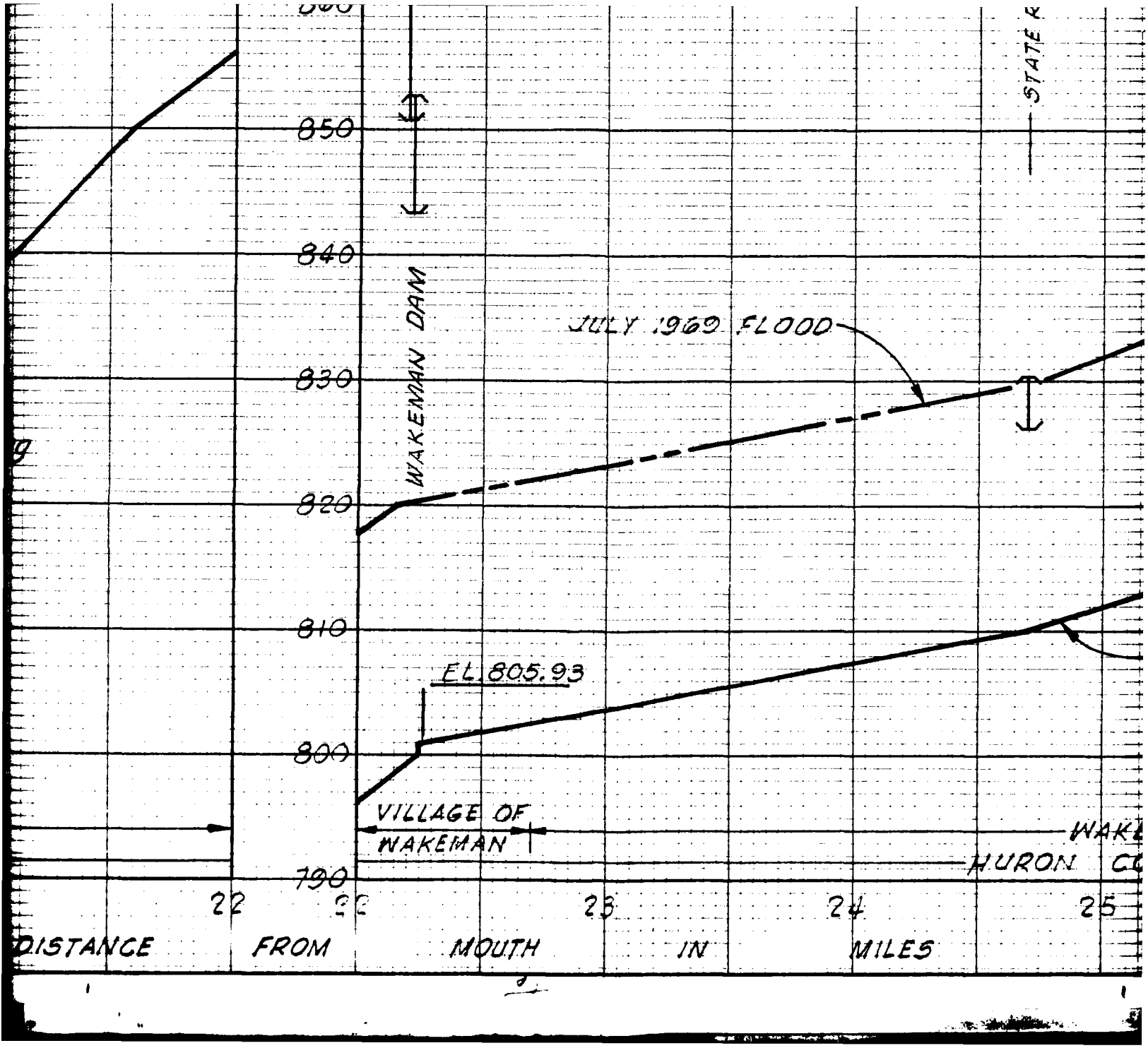
REPORT OF FLOOD 4-7 JULY 1969
VERMILION RIVER

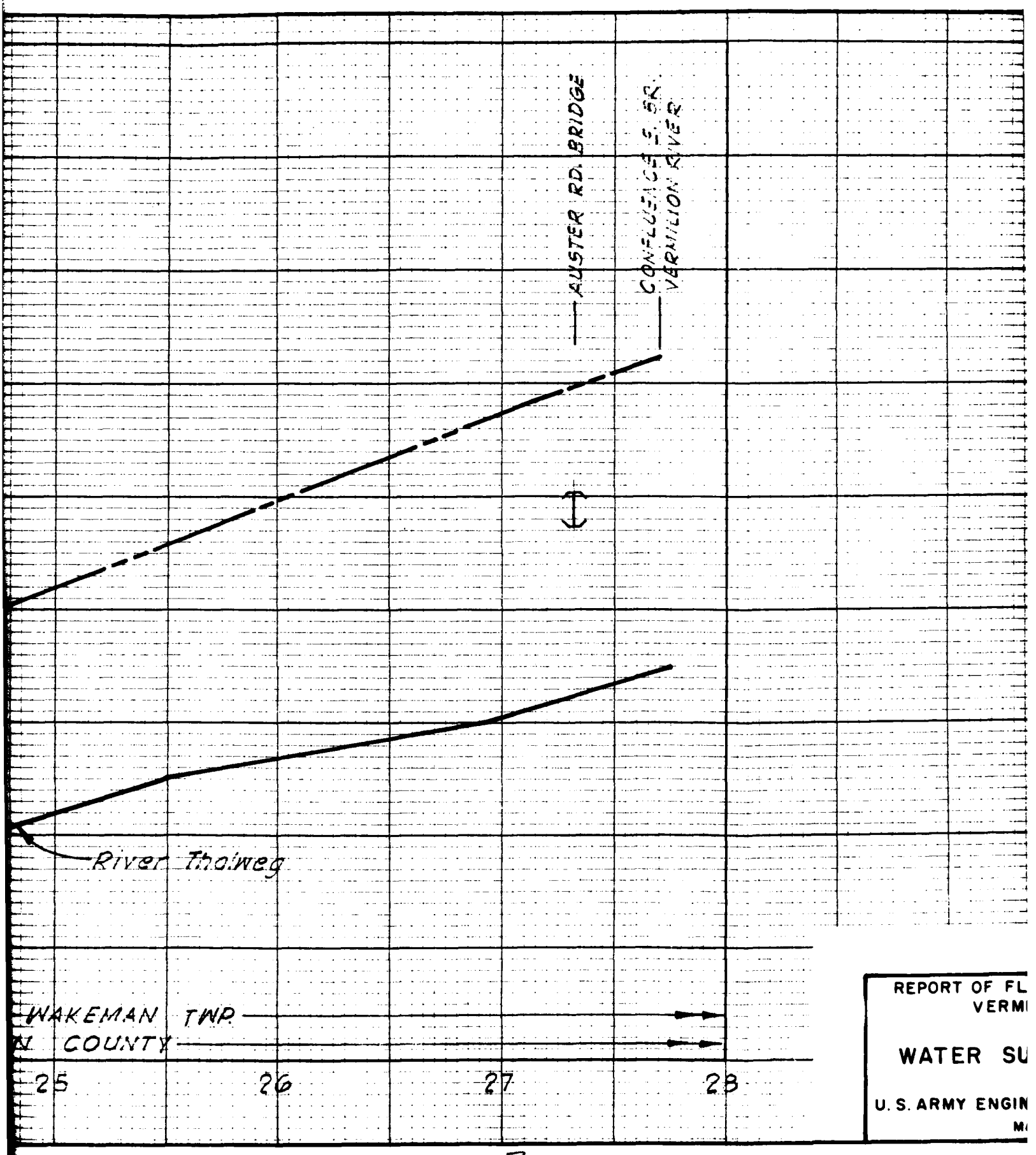
WATER SURFACE PROFILE

U. S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970

PLATE 6


820
810
800
790
780
770
760
750
740
730
ELEVATION IN FEET U.S.C. & G.S. DATUM
JULY 1968 FLOOD
River Thalweg
HAKEMAN TWP.
HURON COUNTY
18
19
20
21
DISTAN

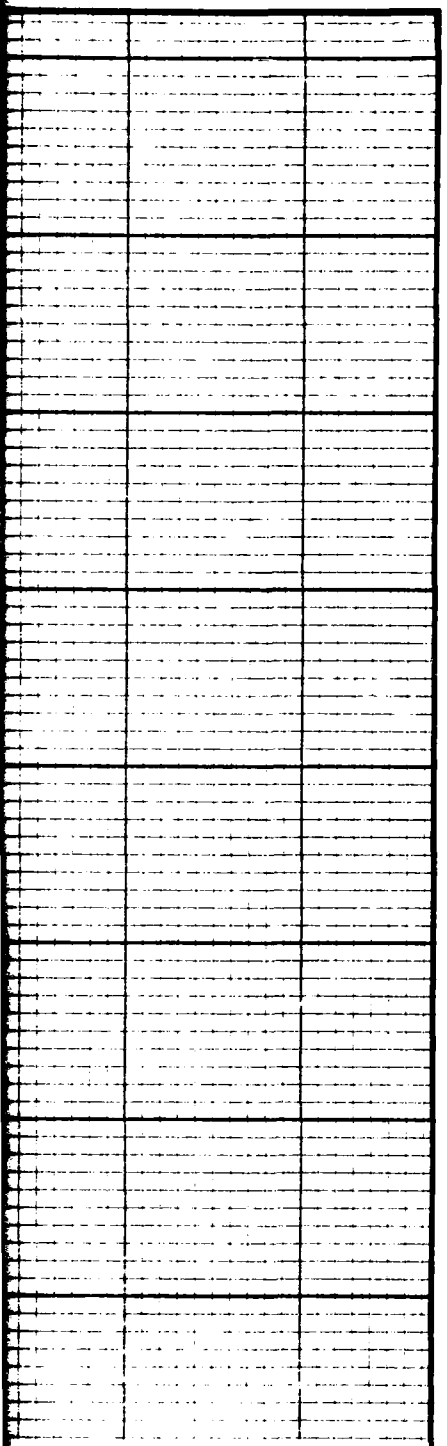

850
840
830
820
810
800
790
WAKEMAN DAM
JULY 1969 FLOOD
EL. 805.93
VILLAGE OF WAKEMAN
HURON
STATE
22
23
24
25
DISTANCE FROM MOUTH IN MILES



REPORT OF FL
VERMI

WATER SU

U. S. ARMY ENGIN
M

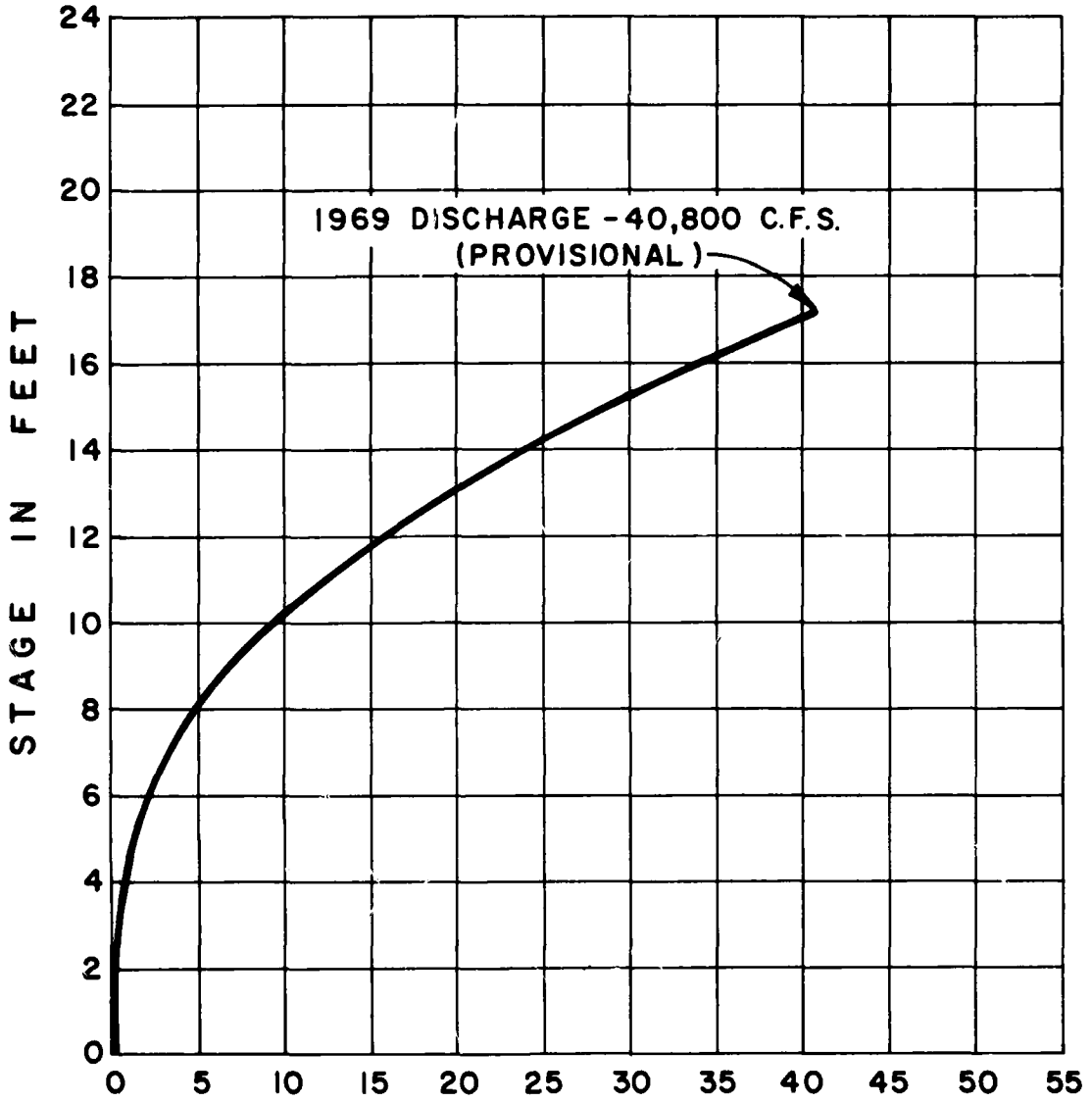


FLOOD 4-7 JULY 1969
ERMILION RIVER

SURFACE PROFILE

GINEER DISTRICT, BUFFALO
MARCH 1970

1 4 PLATE 7



STATION DATA

ZERO OF GAGE = 594.91 U.S.C.&G.S. DATUM.

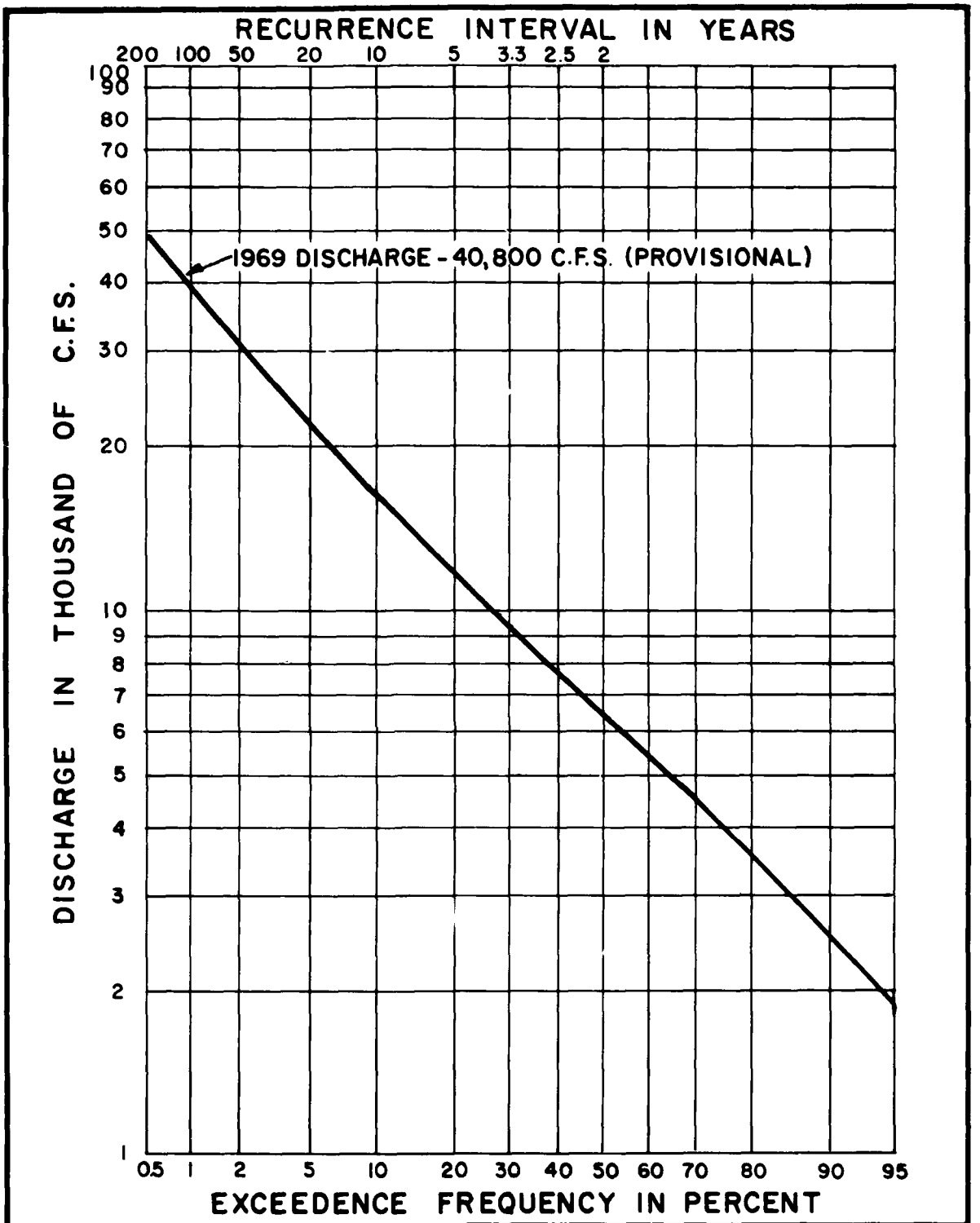
REPORT OF FLOOD 4-7 JULY 1969
VERMILION RIVER

STAGE-DISCHARGE CURVE

U.S.G.S. GAGE DOWNSTREAM
OF NORTH RIDGE ROAD

U.S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970

PLATE 8



NOTES:

DRAINAGE AREA = 262 SQUARE MILES.

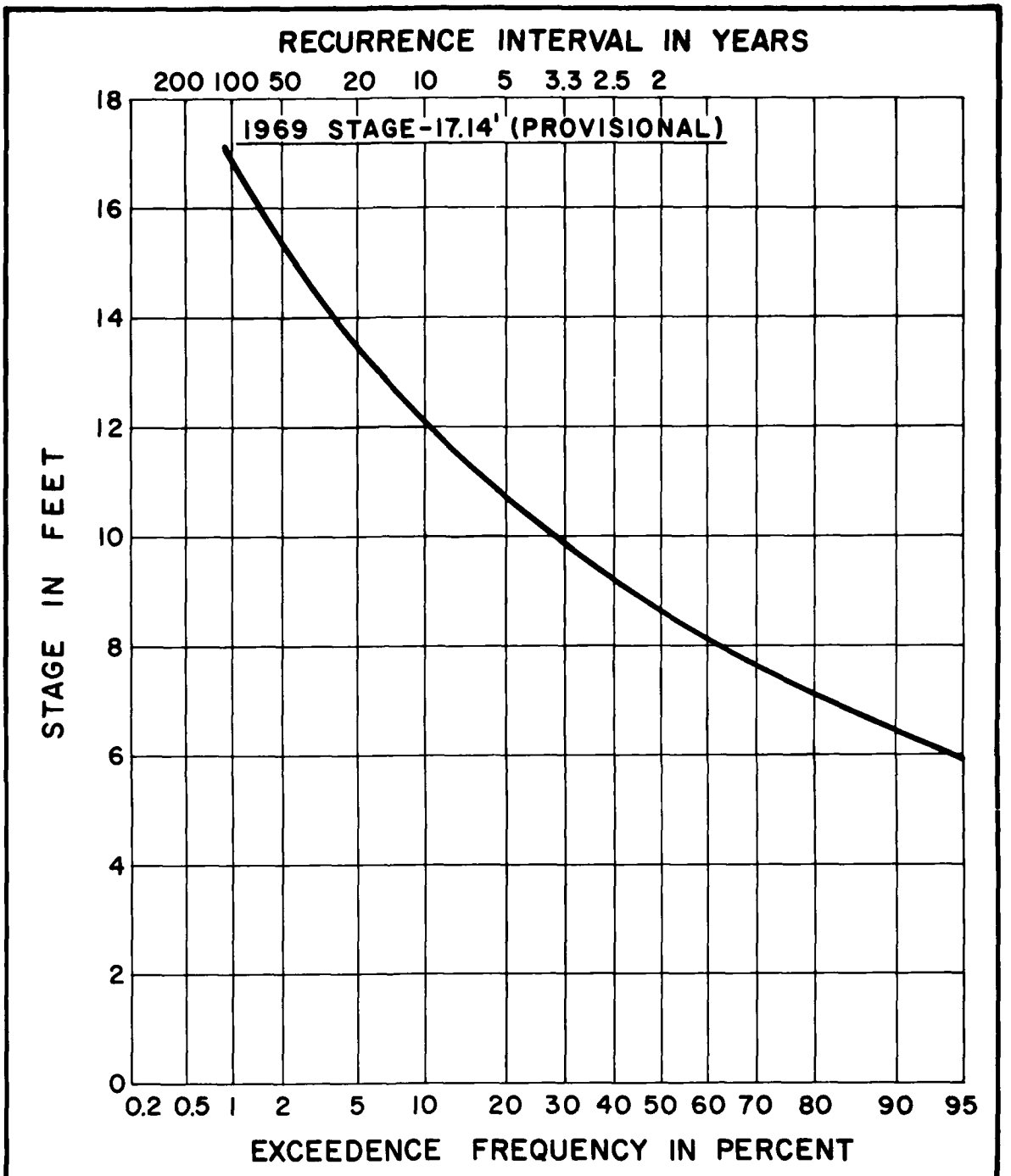
REPORT OF FLOOD 4-7 JULY 1969
VERMILION RIVER

DISCHARGE-FREQUENCY CURVE

U.S.G.S. GAGE DOWNSTREAM OF NORTH RIDGE ROAD

U.S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970

PLATE 9



NOTES:

ZERO OF GAGE = 594.91 U.S.C.& G.S. DATUM

DRAINAGE AREA = 262 SQUARE MILES.

REPORT OF FLOOD 4-7 JULY 1969
VERMILION RIVER

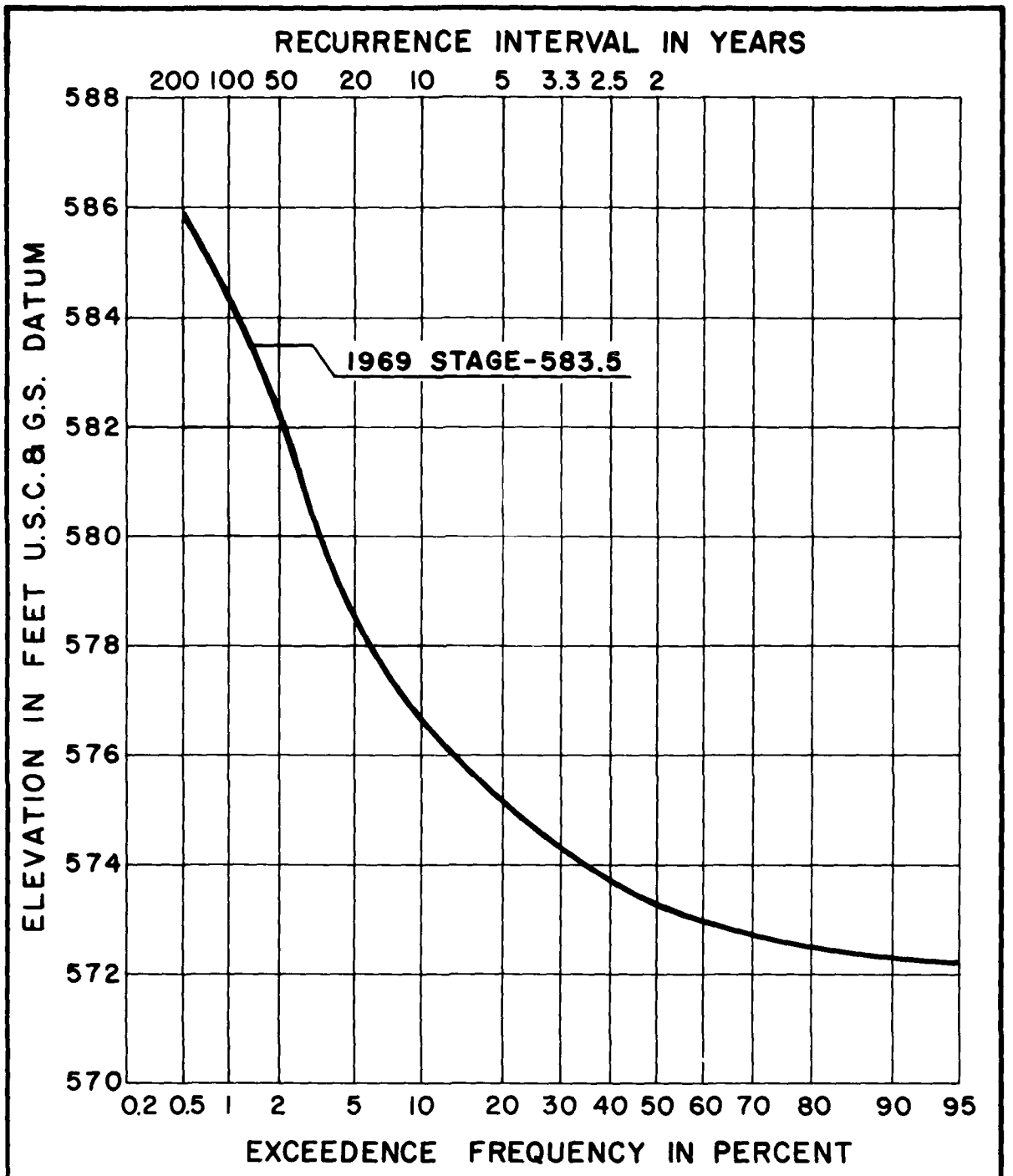
STAGE-FREQUENCY CURVE

U.S.G.S. GAGE DOWNSTREAM OF NORTH RIDGE ROAD

U.S. ARMY ENGINEER DISTRICT, BUFFALO

MARCH 1970

PLATE 10



REPORT OF FLOOD 4-7 JULY 1969
VERMILION RIVER

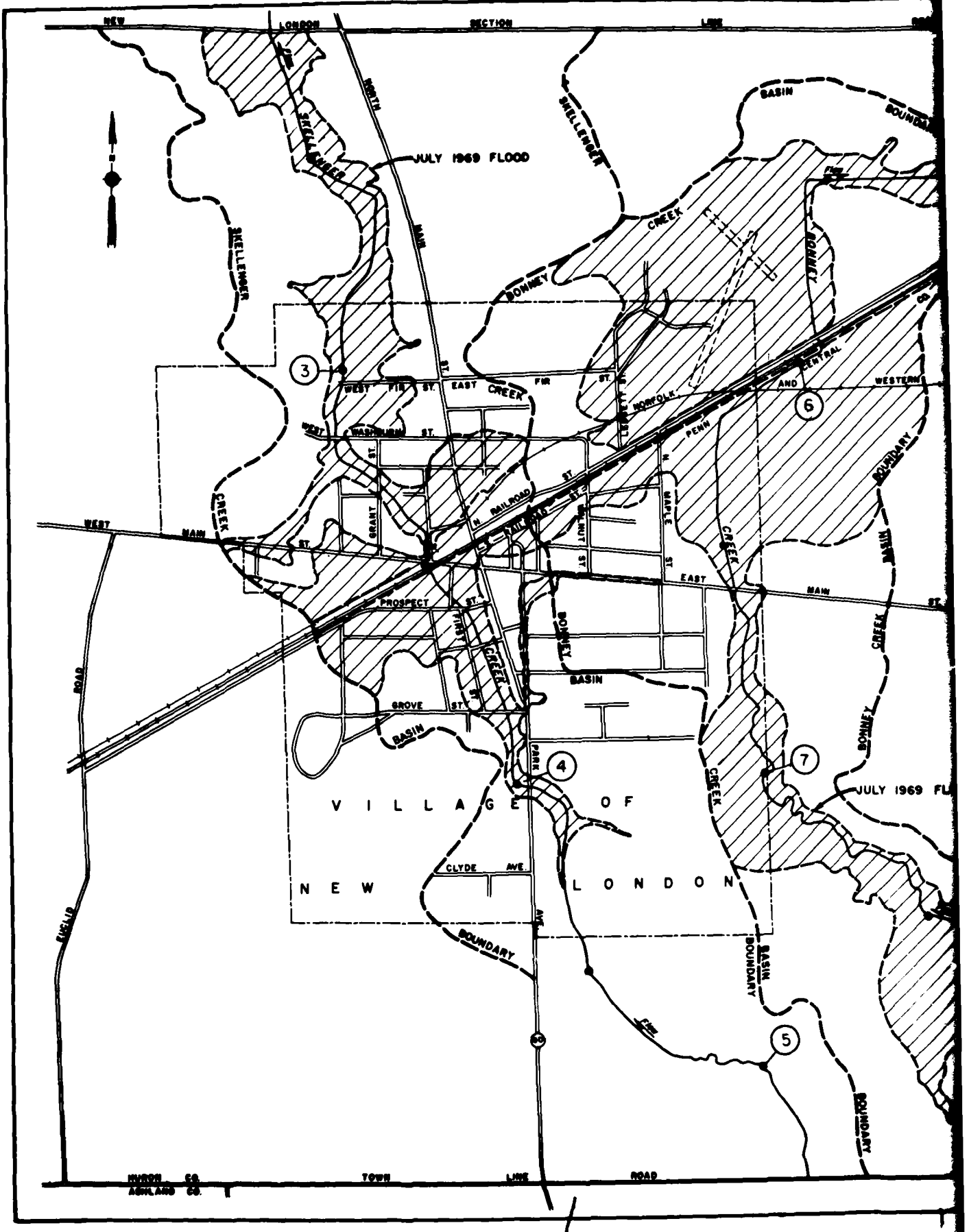
STAGE-FREQUENCY CURVE

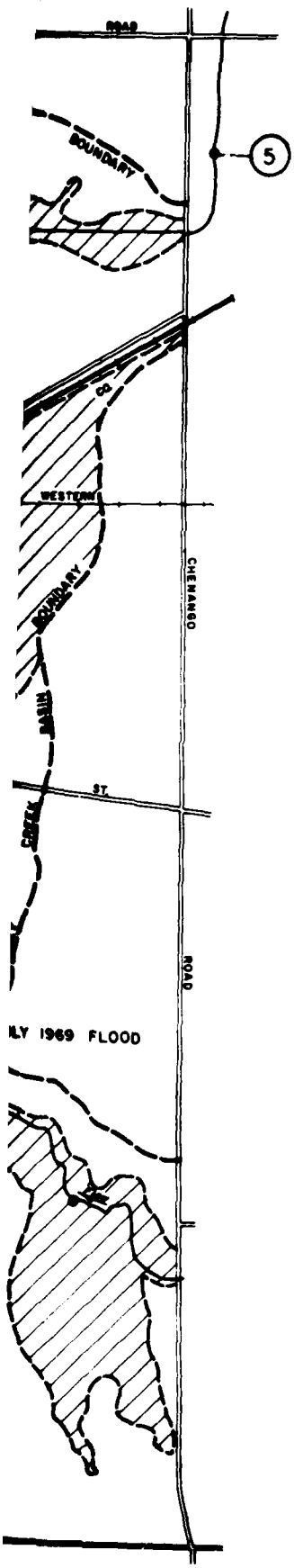
DOWNSTREAM SIDE OF
PENN CENTRAL R.R. BRIDGE

U.S. ARMY ENGINEER DISTRICT, BUFFALO

MARCH 1970

PLATE 11


NEW LONDON SECTION LINE
JULY 1969 FLOOD
SKELLENGER CREEK
NORTH MAIN ST.
BONNEY CREEK
BASIN BOUNDARY
3
WEST FIR ST.
EAST FIR ST.
NORFOLK AND WESTERN
CENTRAL PENN
6
WEST WASHBURN ST.
N. RAILROAD ST.
WEST MAIN ST.
GRANT ST.
MAPLE ST.
EAST MAIN ST.
PROSPECT ST.
FIRST ST.
GROVE ST.
BASIN
4
7
VILLAGE OF NEW LONDON
CLYDE AVE.
BOUNDARY
5
ROAD
IVORY CO. ASHLAND CO. TOWN LINE ROAD



LEGEND:

JULY 1969 FLOOD

(5) DISTANCE IN MILES FROM CONFLUENCE WITH EAST BRANCH, VERMILION RIVER.

SCALE OF FEET

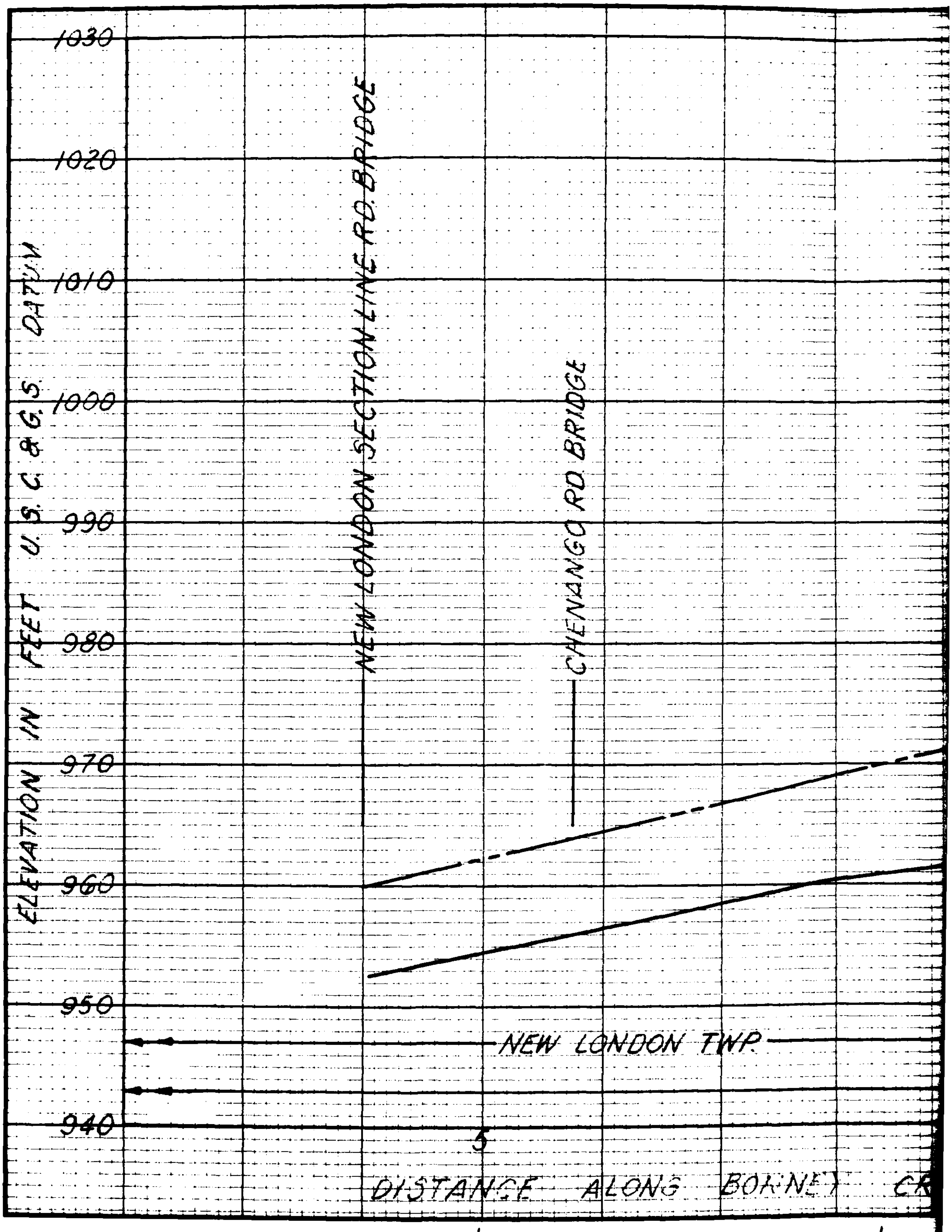
1000 0 1000 2000

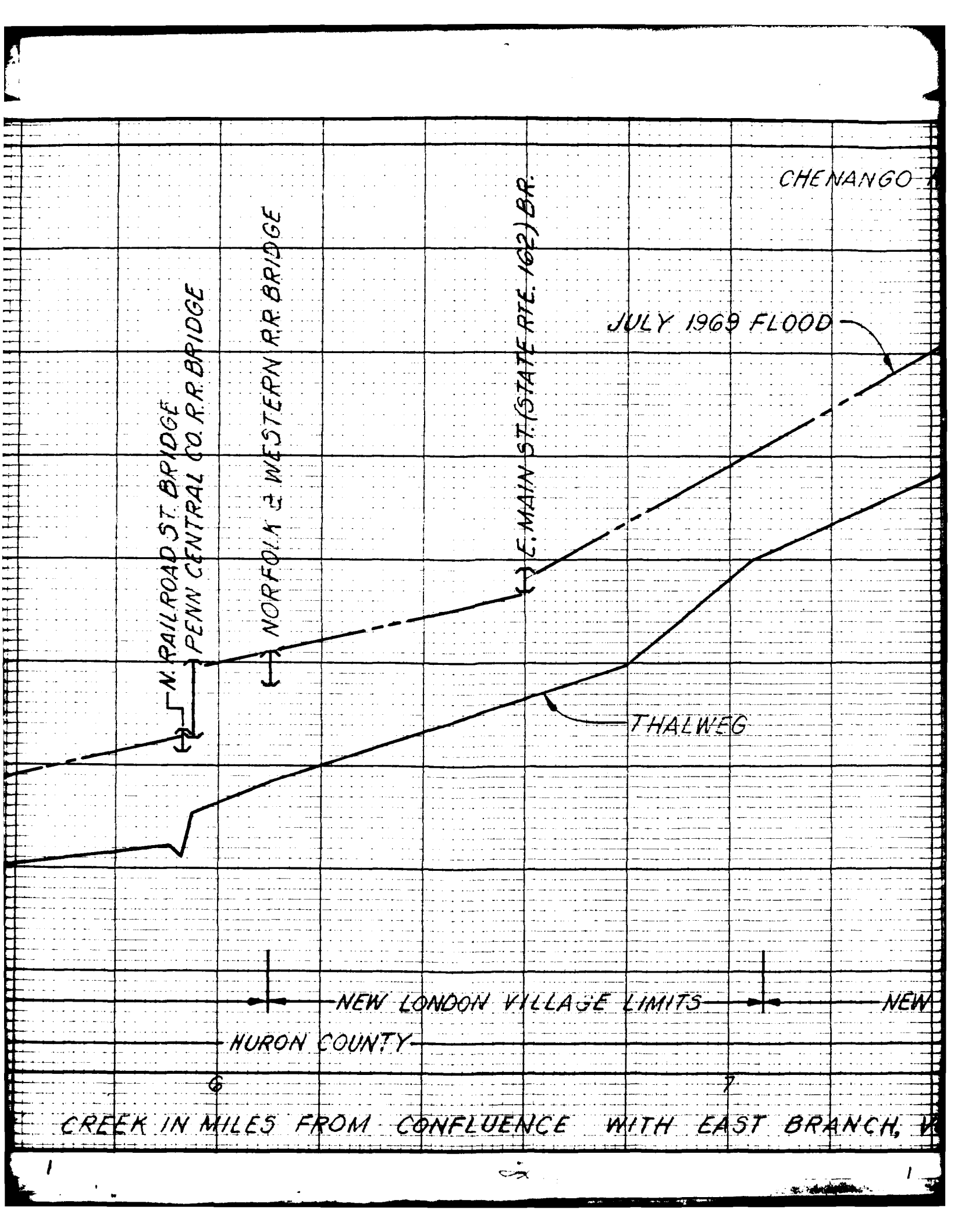
REPORT OF FLOOD 4-7 JULY 1969
BONNEY AND SKELLENGER CREEKS

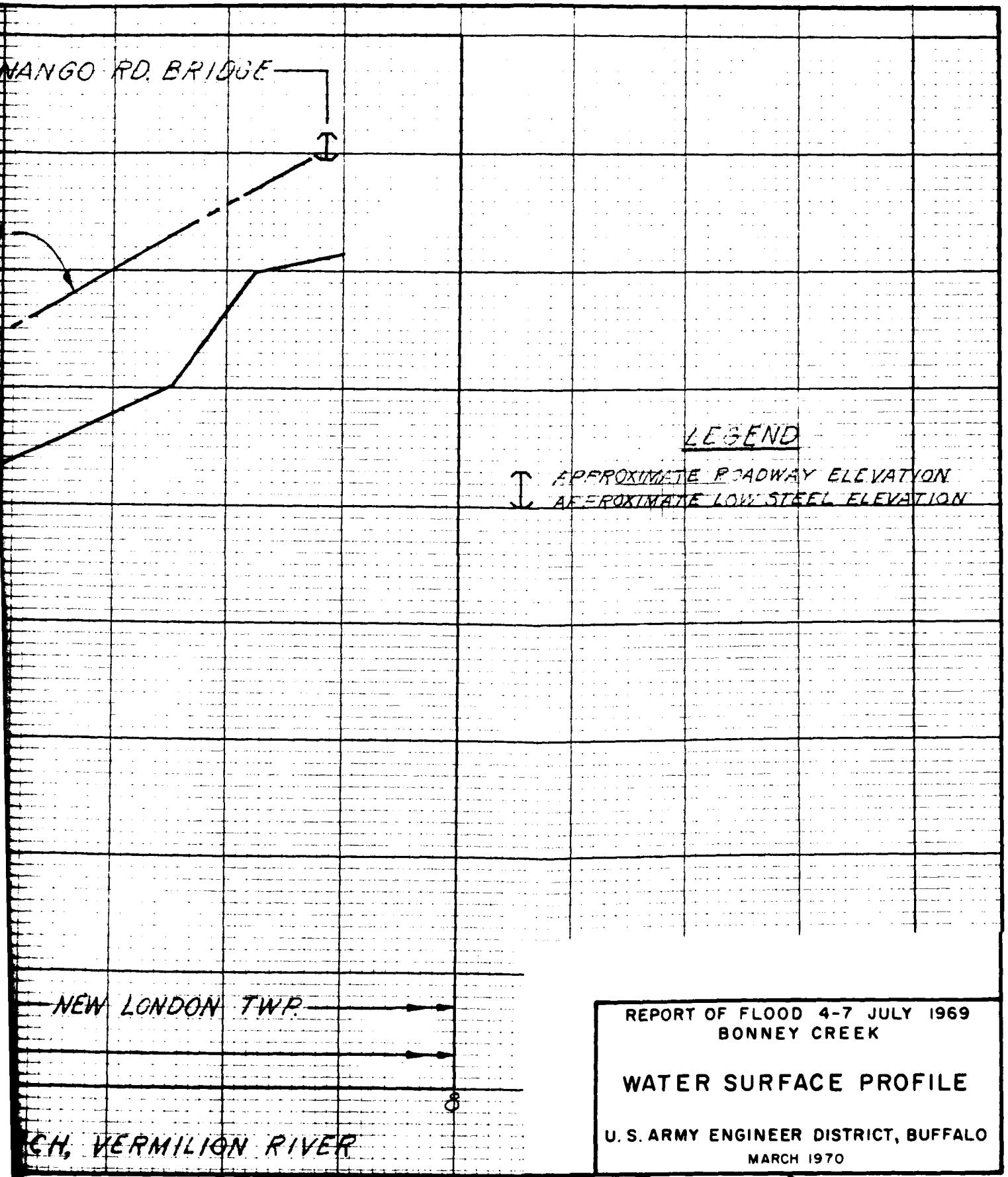
FLOODED AREA MAP

U. S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970

PLATE 12


ELEVATION IN FEET U.S.C. & G.S. DATUM
1030
1020
1010
1000
990
980
970
960
950
940
NEW LONDON SECTION LINE RD. BRIDGE
CHENANGO RD. BRIDGE
NEW LONDON TWP.
5
DISTANCE ALONG BORNEY CR

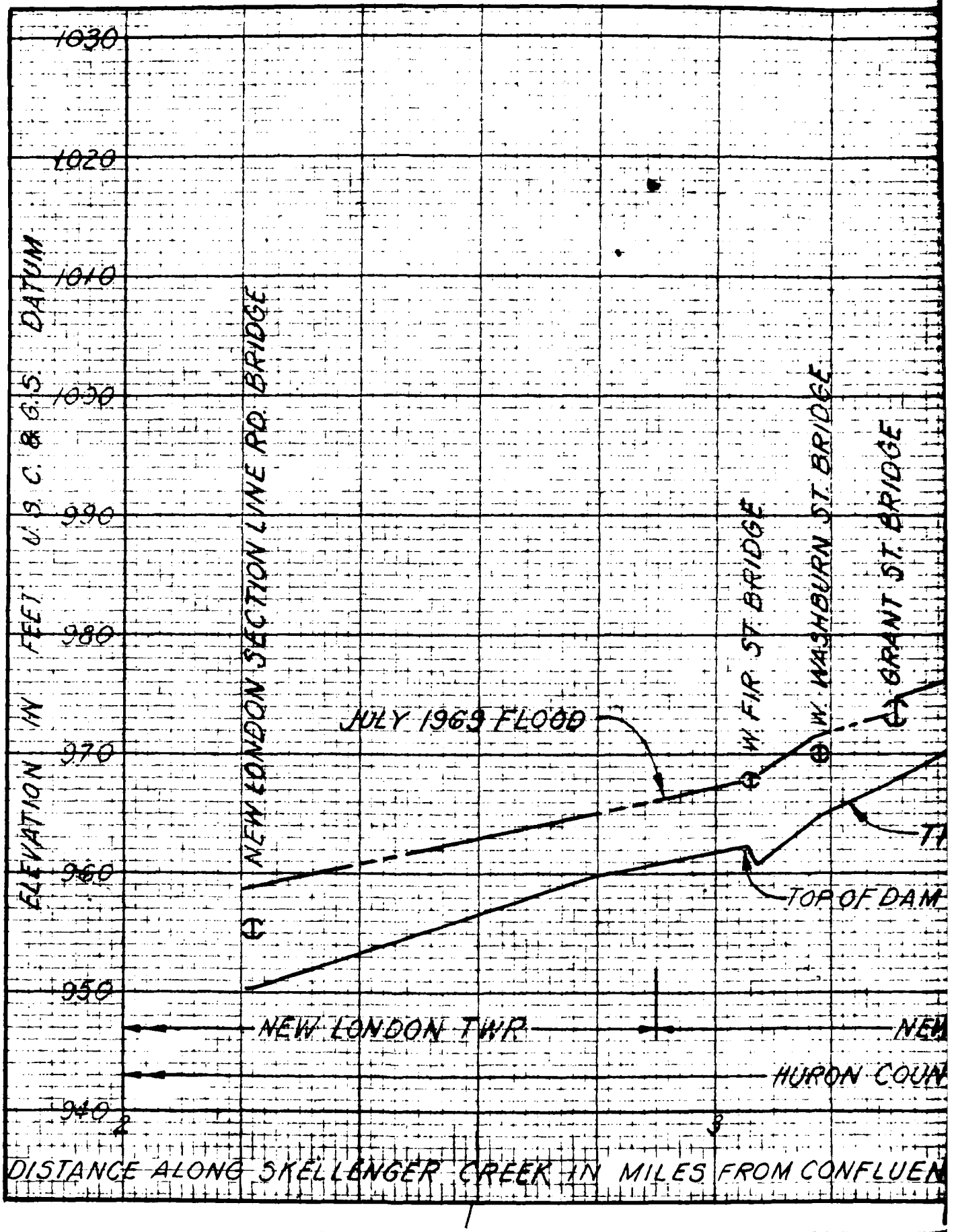

CHENANGO
JULY 1969 FLOOD
N. RAILROAD ST. BRIDGE
PENN CENTRAL CO. R.R. BRIDGE
NORFOLK & WESTERN R.R. BRIDGE
E. MAIN ST. (STATE RTE. 162) BR.
THALWEG
NEW LONDON VILLAGE LIMITS
NEW
HURON COUNTY
6
7
CREEK IN MILES FROM CONFLUENCE WITH EAST BRANCH,

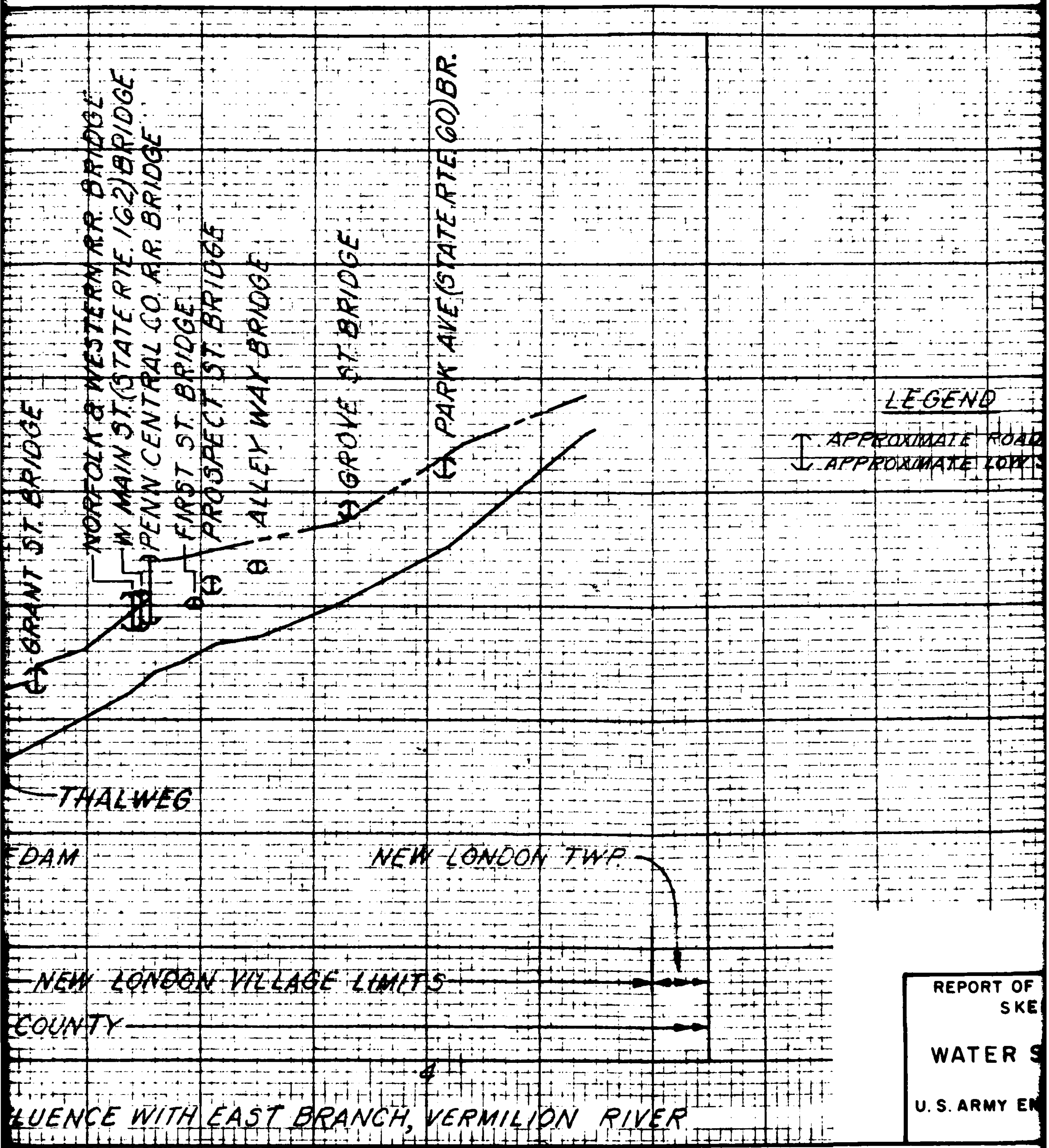


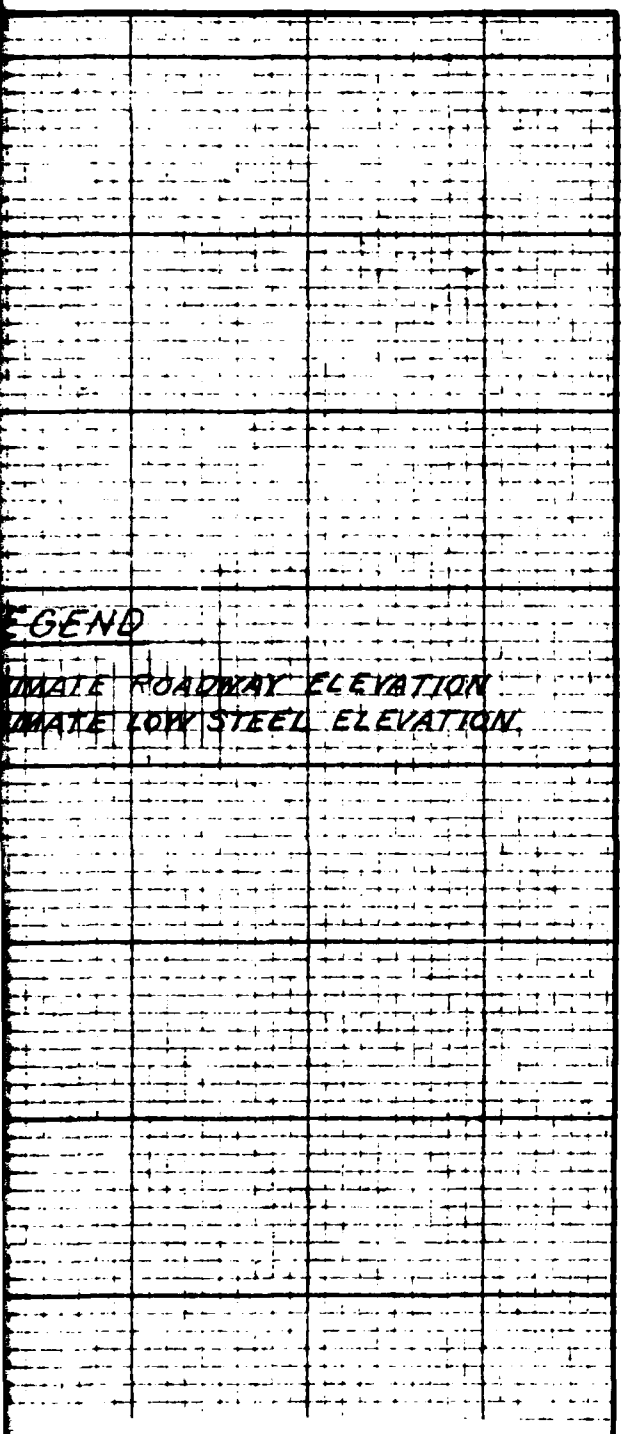
REPORT OF FLOOD 4-7 JULY 1969
BONNEY CREEK

WATER SURFACE PROFILE

U. S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970


1030
1020
1010
1000
990
980
970
960
950
940
ELEVATION IN FEET U.S.C. & G.S. DATUM
NEW LONDON SECTION LINE RD. BRIDGE
JULY 1969 FLOOD
W. FIR ST. BRIDGE
W. WASHBURN ST. BRIDGE
GRANT ST. BRIDGE
TOP OF DAM
NEW LONDON TWP
HURON COUN
2
3
DISTANCE ALONG SKELLENGER CREEK IN MILES FROM CONFLUEN


GRANT ST. BRIDGE
NORFOLK & WESTERN R.R. BRIDGE
W. MAIN ST. (STATE RTE. 162) BRIDGE
PENN CENTRAL CO. R.R. BRIDGE
FIRST ST. BRIDGE
PROSPECT ST. BRIDGE
ALLEY WAY BRIDGE
GROVE ST. BRIDGE
PARK AVE (STATE RTE. 60) BR.
LEGEND
APPROXIMATE ROAD
APPROXIMATE LOW S
THALWEG
DAM
NEW LONDON TWP.
NEW LONDON VILLAGE LIMITS
COUNTY
LUENCE WITH EAST BRANCH, VERMILION RIVER
REPORT OF
SKE
WATER S
U.S. ARMY E



REPORT OF FLOOD 4-7 JULY 1969
SKELLENGER CREEK

WATER SURFACE PROFILE

U. S. ARMY ENGINEER DISTRICT, BUFFALO
MARCH 1970

PLATE 14